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THE CONSTRUCTION OF A MODEL TO TEST-MARKET
THE ZENITH TELEPHONE SERVICE

by



JACK KINPEI ITO

A THESIS

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The undersigned certify that they have read, and
recommend to the Faculty of Graduate Studies for accep-
tance, a thesis entitled THE CONSTRUCTION OF A MODEL TO
TEST-MARKET THE ZENITH TELEPHONE SERVICE submitted by
JACK KINPEI ITO in partial fulfilment of the requirements
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CHAPTER I

INTRODUCTION

Purpose

The purpose of this thesis is to construct a model which will test and evaluate customer reaction to a new service, and which will provide a recommendation on the decision in implementation.

The marketing organization concerned is the catalogue operation, in Western Canada, of the T. Eaton Company of Canada Limited (hereafter referred to as Eaton's). The service being tested is one which enables customers to telephone the Catalogue Sales Office (hereafter referred to as CSOs) nearest them free of charge.¹ The underlying concept is that of increasing total sales for catalogue merchandise by making it more convenient to order. This concept is different from the concept of increasing the firm's share of a fixed sales total at the expense of its competitors. The distinction is important since Eaton's competitors could easily adopt Zenith service.

The basic marketing decision is whether Eaton's should extend its then-existing Zenith service (table, page 2) to a "blanket" coverage of Manitoba and Saskatchewan. The basic concern is whether sufficient additional revenues would be generated to cover the additional costs.

ZENITH SERVICE EXISTING IN MANITOBA AND SASKATCHEWAN
 (prior to the test)

Province		CSO
Manitoba	Brandon* Dauphin	Flin Flon Winnipeg
Saskatchewan	Estevan Esterhazy Melfort Melville Nipawin North Battleford	Prince Albert* Regina Swift Current Tisdale Weyburn Yorkton

*Indicates a test site.

The Model

A model for test marketing the Zenith service in Manitoba and Saskatchewan was constructed and tested by the Industrial Engineering Department of Eaton's Western Division. The writer was the project analyst during the summer of 1968, which was the model building period.

The model presented in this thesis is a modification of the Western Division study. The modification is in terms of an improved analysis of the types of data generated by the original design. The analysis is augmented, where applicable, by additional information known to be available in the records system.² The portion of the original design defining the characteristics of the test data, such as the number of test areas, has not been modified.³ Deviations from the original model are footnoted. The term model will, unless otherwise noted, refer to the thesis model.

The model is constructed in a series of sequential steps:

(a) Three criteria are designated as measures of effectiveness. These are: additional profit, additional sales, and an improvement in customer relations.

(b) A decision rule is formulated. This rule states that the service would be implemented if one of the following conditions is met:

(i) The projected additional profit is > 0 .
(ii) The projected additional profit is < 0 ; the variable costs are covered; and the combination of additional sales and improved customer relations warrants incurring a loss. Because of the uncertainty in measuring customer reaction, management's risk preferences (hopes, expectations, as well as the level of uncertainty acceptable to the decision-makers) have been incorporated into the model. Therefore, the projections are characterized by acceptable risk.

(c) The model defines additional sales as the product of six factors, of which three (the number of calls, the proportion of calls resulting in an order, and the proportion of such order calls resulting in a new order) are the parameters measured in the experiment (management expresses its risk preferences for the latter two factors). The remainder of the necessary data is available in the records system.

Care was taken in the design to follow the experimental concepts of internal validity (accounting for sources of interference such that a cause-effect relationship is clearly established) and external validity (the simulation of the "real world" situation).⁴

(d) Five test regions were chosen in the original model.

The choice was not based on a random process. Considerations involved in the choice concerned the personnel in the CSOs, since control over input data was important, the size and isolation of the region, and consensus by the decision-makers.

(e) The service was introduced on August 21, 1968 and was preceded by mailed advertising to the customers in the test regions. The data were gathered, for the original model, for the period beginning August 21, 1968 to February 15, 1969. Because Eaton's is withholding actual data for competitive reasons, the writer has constructed fictitious data in order to test the model.

Findings

The result, using the fictitious data, is that a "blanket" Zenith service would produce an additional annual profit of \$5,291. Based upon the decision rule, the service would be implemented.

The limitations of the model deal primarily with the problem of external validity. The problem of the validity of extrapolating from the test situation to the "real world" is one which continually besets the market researcher.⁵ First, there is the problem of the small sample size, necessitated by managerial considerations. Second, there is the problem of simulation of the market as it would be if the service were introduced. Blanket service would be accompanied by heavier advertising than was included in the test. Further, there is the question of how the customers would react once accustomed to the service.

For example, the proportion of calls which do not directly result in sales, such as complaints, may increase above the test proportion. The above limitations are discussed in the analysis of the model. Third, there is the problem of changes in economic and competitive conditions. If, for example, disposable family income were to decline, additional sales would be expected to decline as well. The model, in effect, is valid for a particular set of economic and competitive conditions. No attempt has been made to place the service in the larger context of the consumer's environment.

However, despite these and other limitations discussed in the concluding chapter, the test reduces the uncertainty faced by the decision-makers. It does provide a more rational basis for decision than either bargaining among interested parties or intuitive judgment.

CHAPTER II

BACKGROUND

Introduction

This chapter begins with a description of the segments of the marketing system relevant to the model. These are the catalogue distribution system and the marketing channel. After a description of the Zenith telephone service, the reasons for anticipating additional sales are discussed. This is followed by a description of the original model, with specific emphasis on the structural aspects (for example, the method of choosing test regions).

Eaton's Marketing Organization

Catalogue retailing, in essence, consists of: the distribution of catalogues which describe and illustrate merchandise offered for sale, and the filling and delivering of the order.

(a) Catalogue distribution

Usually two main catalogues are distributed. These are: the Fall and Winter, and the Spring and Summer catalogues. Each publication offers a wide assortment of both seasonal and standard merchandise. Periodically, smaller sale catalogues and fliers are issued. These offer a limited selection of specially-priced merchandise.

The criterion used in distributing the various types of catalogues is based on the customer's purchase record. Customers are categorized, at the time of compiling the mailing list, on the basis of frequency and volume of purchases. Thus, while most customers on file will receive sales catalogues, a smaller number will receive the major books. After a period of time, names in categories which are of the lowest priority are deleted from the files. Catalogues are also available upon request, but not all requests are filled due to the restricted supply.

(b) The marketing channel

As previously stated, Eaton's is a nationwide retailing organization merchandising through both a chain of department (and heavy goods) stores, and a catalogue operation.

The marketing channel (Figure 1, page 17) of the catalogue operation consists of three catalogue "Houses" in each of Winnipeg, Toronto, and Moncton; and a number of CSOs distributed throughout the nation. Each CSO is responsible to one of the Houses. Each House serves as the administrative and operational (warehousing and merchandise distribution) center for the particular region. The supervisor of each CSO reports to a District Sales Supervisor who in turn reports to the top management for the Division. CSOs either utilize space in an Eaton's store or, as in the case of most small towns, a separate building is constructed or rented. The CSOs typically have display counters in addition to the catalogue service which offer "specials" on merchandise which has been either returned by the customer or sent from the House

for direct sale. While the majority of CSOs are company-operated, some are commissioned agencies (Figure 2, page 18).

Customers can place an order either directly to the House, by mail or phone, or indirectly through the CSO, either over the counter or by phone. Few customers, if any, will mail an order (or an inquiry) to a CSO. All catalogue orders, except for the miscellaneous goods carried at the CSO, are filled by the House or by the manufacturer (or distributor), who would receive such orders from the House. Some orders are placed for store merchandise through the catalogue operation. Merchandise is sent either direct to the customer, or to the CSO in bulk express shipments for local delivery, or to be held for the customer (Figure 3, page 19).

Telephone Service

Telephone service is available in all areas of each Province except for some few negligible exceptions. Each Province is sectioned by the telephone companies into Exchange areas (Figure 4, page 20) which vary considerably in coverage both in terms of population and in terms of geography. There is free calling (no long distance charges) within each exchange and between some exchanges.

Zenith telephone service enables a person to call a firm collect, by dialing the Operator and asking for the Zenith number. For the firm it is a form of collect calling at a reduced rate of charge per call. In Eaton's case, this service would enable the customer to telephone a specified CSO free of charge by asking for Zenith 1-5000. The customer

is connected automatically to a previously selected CSO according to the agreement between Eaton's and the telephone company. For this service the telephone company charges an amount per exchange which varies inversely (by increments) with the number of exchanges. In addition, there is a fixed amount charged for listing Zenith service in the telephone directory.

Zenith Service and Additional Sales

It is expected that Zenith service will increase sales for three reasons. First, the added convenience of telephone ordering as compared to ordering by mail is expected to result in purchases which otherwise would not have been made. Ordering by mail entails such details as filling out order forms or writing letters, finding stamps, and mailing. It is possible that such details would discourage purchases of minor importance, or purchases of "impulse" items.⁶ It is possible that these purchases would be made in the future through Eaton's catalogue. However, it is also possible that they may be delayed indefinitely, or made at a retail outlet in town. The convenience of telephone ordering may well make the difference in the decision of whether or not to order.⁷

The second reason is that the customer may make impulse buying decisions while on the telephone placing other orders or making an inquiry. The telephone order clerks try to stimulate further purchases by such means as bringing special sale merchandise to the customer's attention.

The third reason is that the added convenience of in-home buying may shift some sales from in-town shopping to catalogue shopping.⁸ The trend toward in-home buying is one which E. B. Weiss suggests will develop into a major change in the nature of retailing.⁹ As one example, he cites J. C. Penney as an in-store retailing organization which has become heavily involved in catalogue sales.¹⁰ This trend, he suggests, is due to the time and effort expended in in-store shopping. It would not be expected, at least by this student, that this trend will have as large an impact on the rural areas as on the urban areas. The reason for this is that in-town shopping for rural residents may have social amenities in addition to the objective of purchasing goods.

The Marketing Decision

In the decision of whether or not to implement a "blanket" Zenith service, one concern was whether the additional sales would cover the additional costs. (The variable costs are covered -- a condition for both segments of the decision rule.) The consumers' reaction to the easier method of ordering introduced an area of uncertainty into the decision. Two specific concerns were: the degree to which the mode of ordering was transferred from mail (or CSO counter) to telephone; and the proportion of non-order calls. A further consideration was the feeling that the service, once implemented, would be irrevocable without damaging customer relations. Given these considerations, a market test was undertaken to provide further information on the nature of the customer reaction.

The original model to be used in the market test was to have been a replication of a 1967 study conducted in Ontario and Quebec by analysts in the Central Division.¹¹ This study concluded that the service was profitable, and the decision was made to implement the service in those two Provinces. However, it was felt that the information from the Central Division was not transferable to the Prairie Provinces. The major reason was the difference in the marketing environments between the Western and Central Divisions.

The Original Model

This section discusses the original model, with specific emphasis on its structural aspects. The analytic portion of the model (the analysis of data) is not described in detail. The reader may assume that the model used in this thesis and the original model are congruent except where specified.

Information requirements

The potential additional sales for the original model was the product of the following six factors:

- (a) The number of Fall Sale catalogues, and the number of household telephones in the potential new Zenith areas (two bases of projection);
- (b) The annual number of calls per catalogue;
- (c) The portion of calls resulting in an order;
- (d) The portion of such calls resulting in a new order;
- (e) Average gross value of a telephone order; and

(f) A factor adjusting (e) for cancellations and exchanges.

The measurement of consumer response involved measuring the number of calls (for use in factor (b) above), and factors (c), (d), and (e). In effect, these were the unknown values to be measured by the experiment, although some a priori evidence was available from the Toronto study. The data for the remaining factors, as well as most of the pertinent cost information, was available in the records system.

The following cost factors were used in the study.

- (a) Cost of goods sold
- (b) Variable operating costs (including delivery costs)
- (c) Delivery costs
- (d) A factor to account for the additional delivery costs incurred when an order is transferred from CSO pickup to direct mail delivery.
- (e) Long distance charges
- (f) Fixed telephone service/listing charges, plus advertising and labour costs.

The variable additional costs were composed of factors (a), (b), and three others. These latter were the long distance charges for transferred business (the phone sales less business transferred from DM or CSO ordering); long distance charges for inquiries; and a transfer in the method of delivery.

Information output

The output of the original model was: additional profit (loss) for each of the test regions; and a projection of profit (loss) based upon optimistic, average, and pessimistic estimates of the customer

response factors. In the report issued, the number of household telephones was the sole basis of projection.¹² The degree of optimism-pessimism was decided upon by the individuals directly involved in the study.

Selection of test regions

The number of test regions was limited to three in Manitoba and two in Saskatchewan. The primary reason was that Zenith, if the test proved it unprofitable, could not be removed from the test sites without damaging customer relations to some extent. The alternative of using a larger number of test sites, but reducing the number of exchange areas, would have affected the validity of the primary assumption, which is discussed beginning on page 32.

The test regions selected were: areas within the trading areas of Brandon and Roblin in Manitoba; and Prince Albert and Kindersley in Saskatchewan; and the Southwestern corner of Manitoba.¹³ Calls from this last region were directed to Brandon. The trading area for a particular town was delineated by the Market Research Department (for a separate study).¹⁴ These were verified for the four test sites by the District Sales Supervisor for Manitoba, Mr. A. Harrison.¹⁵ The term test region includes the four trading areas, and the Southwestern corner of Manitoba. The term test site refers to the CSOs used in the test. The trading areas were delineated by:

- (a) designating the cities and some of the larger towns as trading centers,¹⁶ and by
- (b) examining each of the towns, villages, and hamlets, and

deciding which trading center would be likely to draw most of the retail business. For the test trading areas, the outer boundaries were drawn such that over fifty per cent of the business of the towns on the boundaries would be directed to the test CSO, rather than to the next closest trading center. The criterion for using a particular exchange was that all the towns in the exchange area were also in the trading area.

The trading areas around Brandon and Prince Albert, and the South-western corner of Manitoba, were chosen for reasons of control over the CSO sales information. Not only were the Supervisors experienced, but also these CSOs were visited more frequently by the District Sales Supervisor than other, smaller CSOs. The Roblin and Kindersley trading areas fulfilled the double criteria of relatively large size (in terms of numbers of customers) and relative isolation from other trading areas which had a CSO. This latter criterion would reduce the probability of overlapping trading areas each of which had a CSO. The problem which would result from an overlap is that a customer who generally shops at trading center A but whose calls are directed to trading center B would probably prefer having her order mailed, rather than calling for it at the CSO. And, as previously mentioned, the delivery cost factor is important. The final consideration was management consensus on the test regions. The writer is not aware of any evidence that the non-random method of selection has introduced bias.

Definition of sample and simulation

One particular problem was the necessity of eliminating the effects of a temporary competitive advantage over Eaton's principal competitor,

Simpson-Sears. At the same time, it was necessary to simulate, as far as possible, the market environment in which Zenith would be actively promoted. To approximate these conditions, only customers who were in the categories which qualified for the 1968 Fall Sale Catalogue were notified of the service. Advertising pamphlets (Exhibits 18 and 19) were mailed to these customers to coincide with the introduction of the service on August 21, 1968. The initial advertising was supplemented by an "insert" in the Winter Sale Catalogue distributed in the third week of December.¹⁷ The same categories of people receiving the Fall Sale Catalogues were scheduled to receive the Winter Sale Catalogues. There was no listing placed in the telephone books advertising the service, nor any other form of promotion.

Sales information recording¹⁸

There were two sources of data relating to customer response. These were the CSO and the Catalogue Distribution Department (hereafter referred to as W 167, which is the department number). The prime concern was the completeness and accuracy of the data, especially from the CSO. To achieve greater control, the cooperation of both District Sales Supervisors, the CSO Supervisors, and W 167 supervision, was secured.

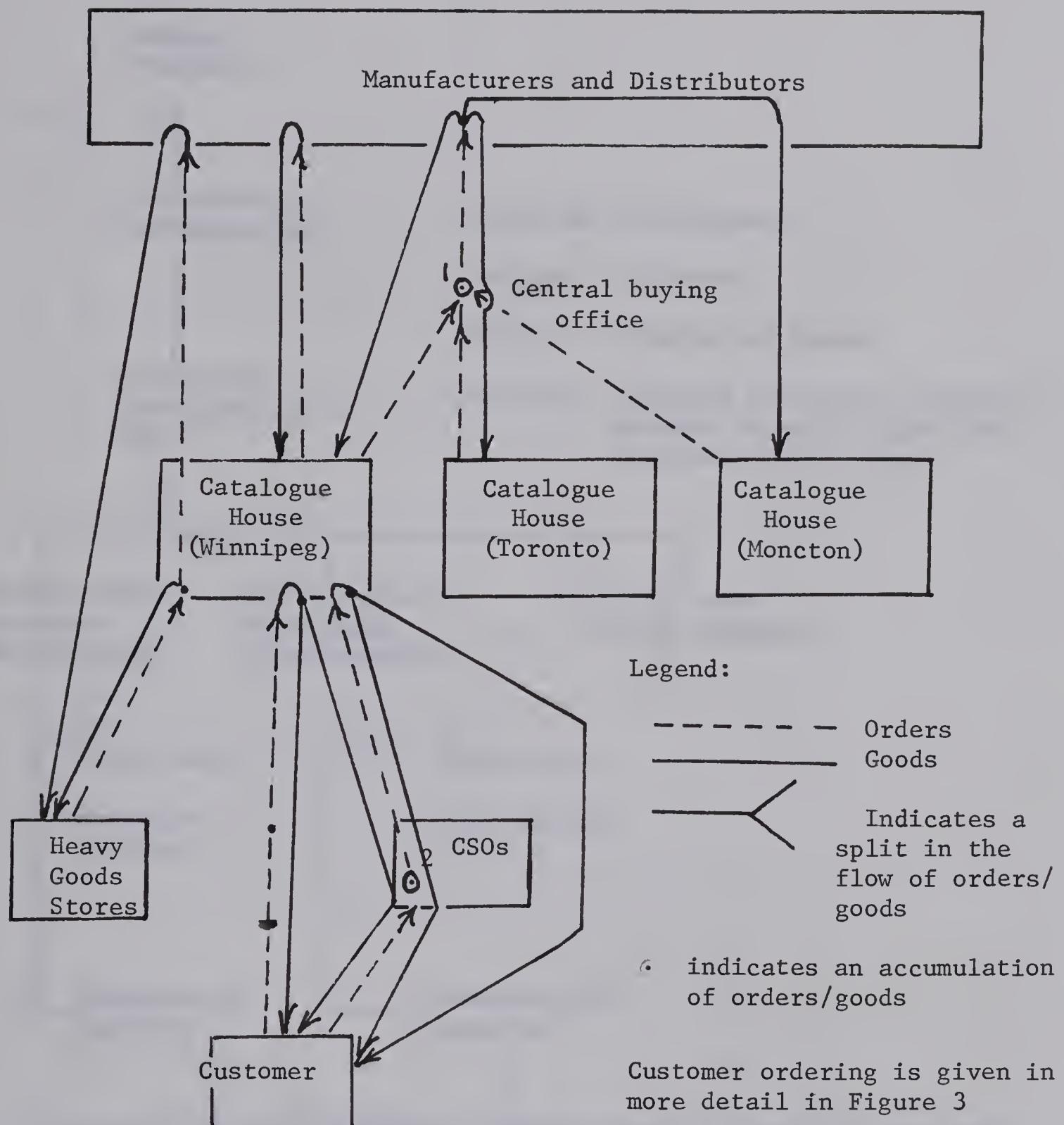
Forms (Exhibit 6) and instructions (Exhibit 16) were issued to each CSO for the recording of calls. The completed forms were sent to Winnipeg each week. CSO Supervisors were encouraged to call the analyst in charge of the experiment if problems occurred.

The data from W 167 consisted of address labels (Exhibit 1), shipping bills, and merchandise-control forms. The towns in the test areas

were designated by a colored card in the tab file containing the customer purchase records. The aforementioned documents were set aside for the designated towns, after the sales had been recorded on the tab cards. The documents were collected by the analyst, for analysis each week.

Conclusion

This chapter has provided background information pertaining to the original model. The following chapter deals with construction of the model in detail. The structural and the analytic aspects are analyzed with respect to experimental concepts. The reader will notice some redundancy in the analysis of the structural aspects.

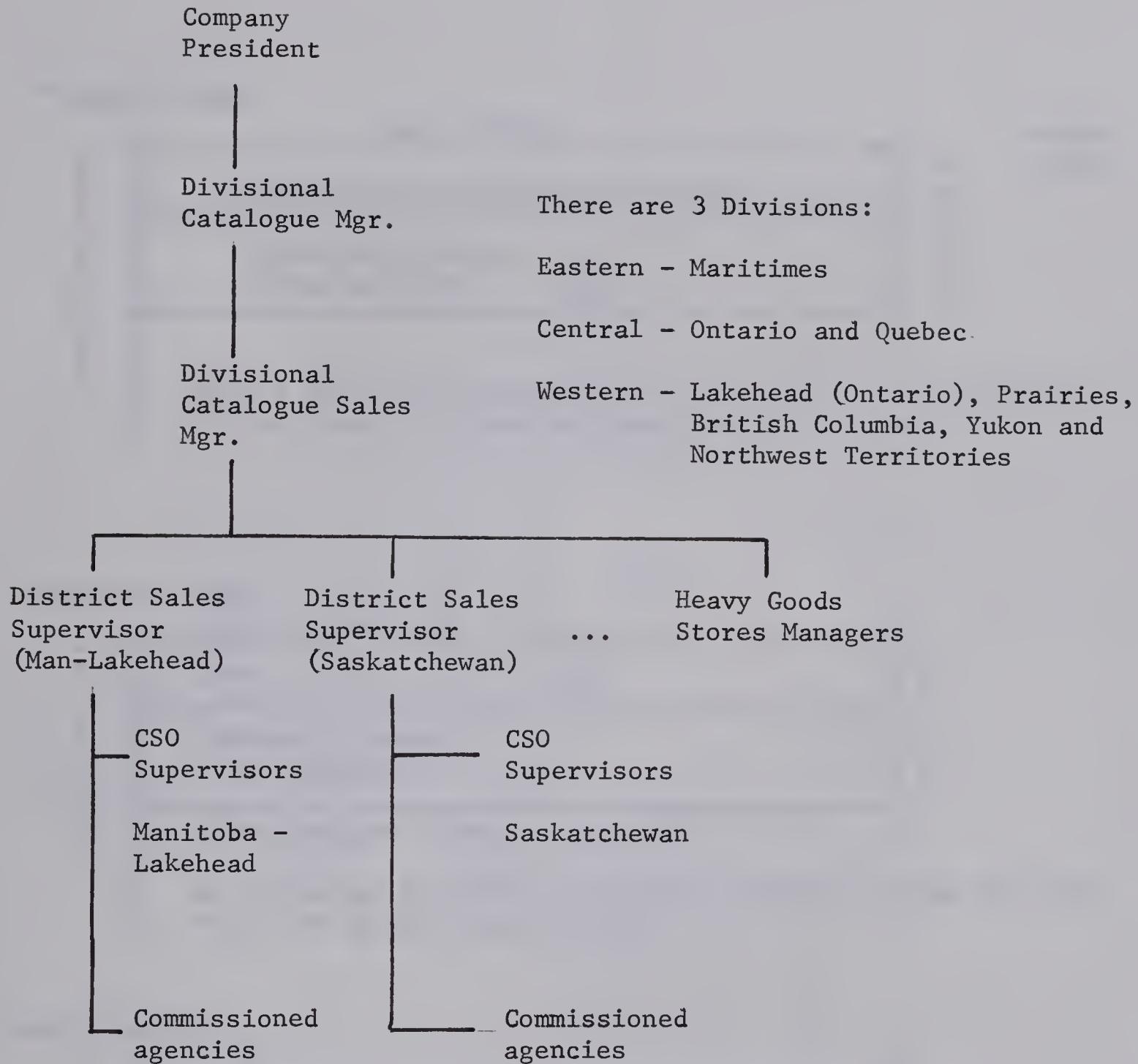


¹All contingencies have not been shown, such as customer's orders shipped direct from the manufacturer.

²Re: .¹ A portion of initial orders for goods in a new catalogue are placed through a central buying office in Toronto, goods being sent direct to the House. Some initial and subsequent orders generally placed direct to the manufacturer/distributor. Transfer of goods among the Houses is also common.

³Re: .² Customer orders are accumulated for the day, before sending to the House for filling.

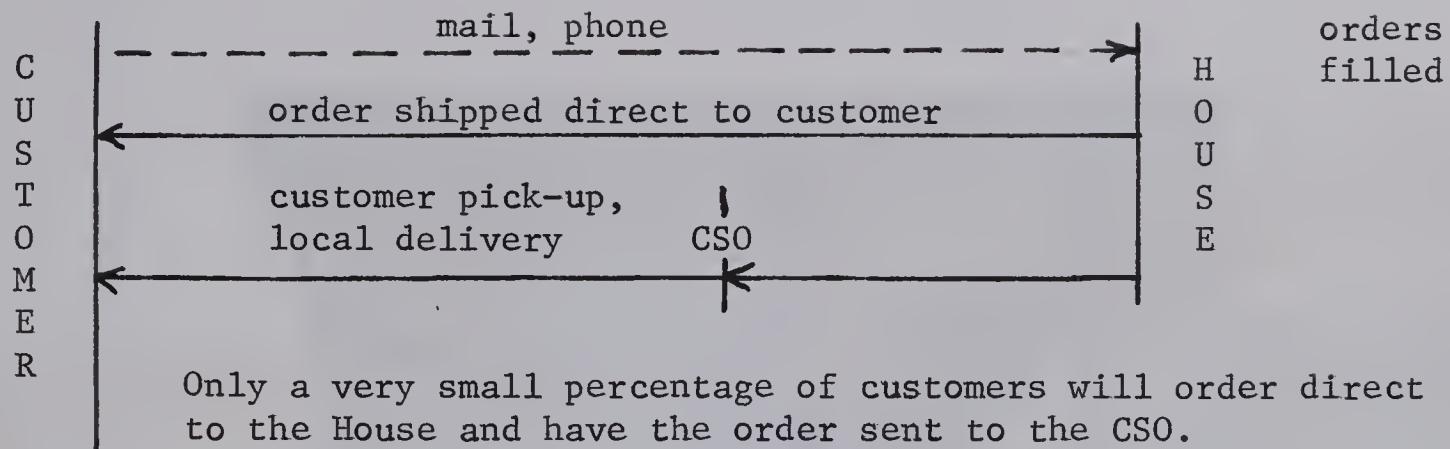
Figure 1. Major Channels of ordering and distribution¹



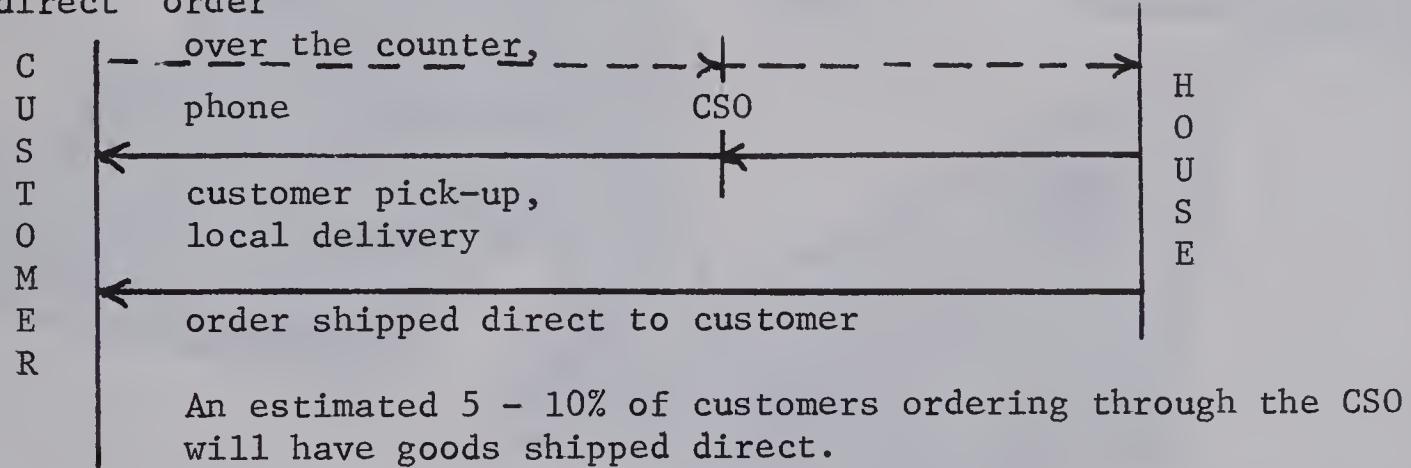
¹The chart is for the Western Division, but the format is the same for all three. In the Western Division, there are 5 District Sales Supervisors: one for each of Manitoba-Lakehead, Saskatchewan, Alberta; two for British Columbia. The Yukon and Northwest Territories are supervised, it is believed, via extensions of the boundaries of the provinces.

Figure 2. Partial Organization Chart¹

"Direct" order



"Indirect" order



Zenith order

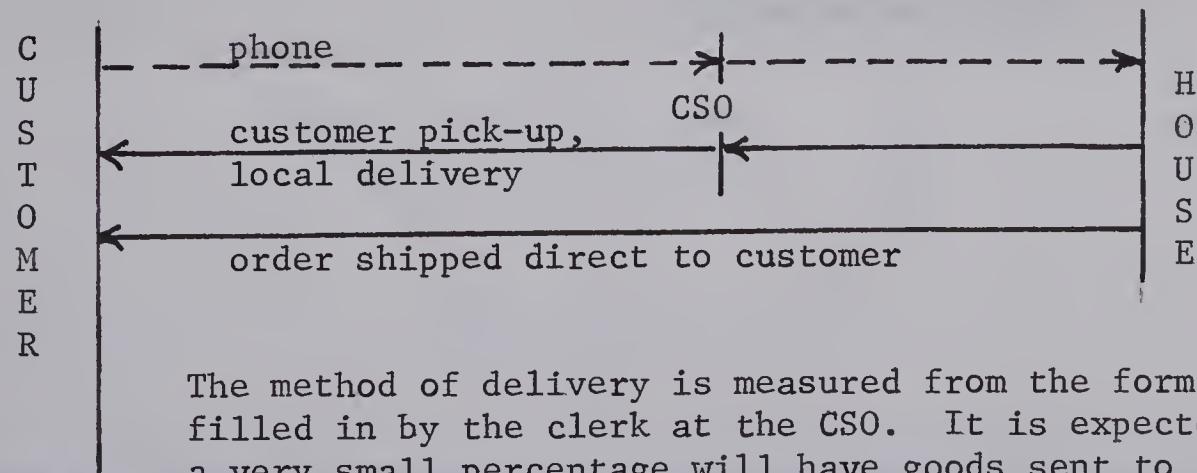


Figure 3. Methods of customer ordering and delivery.

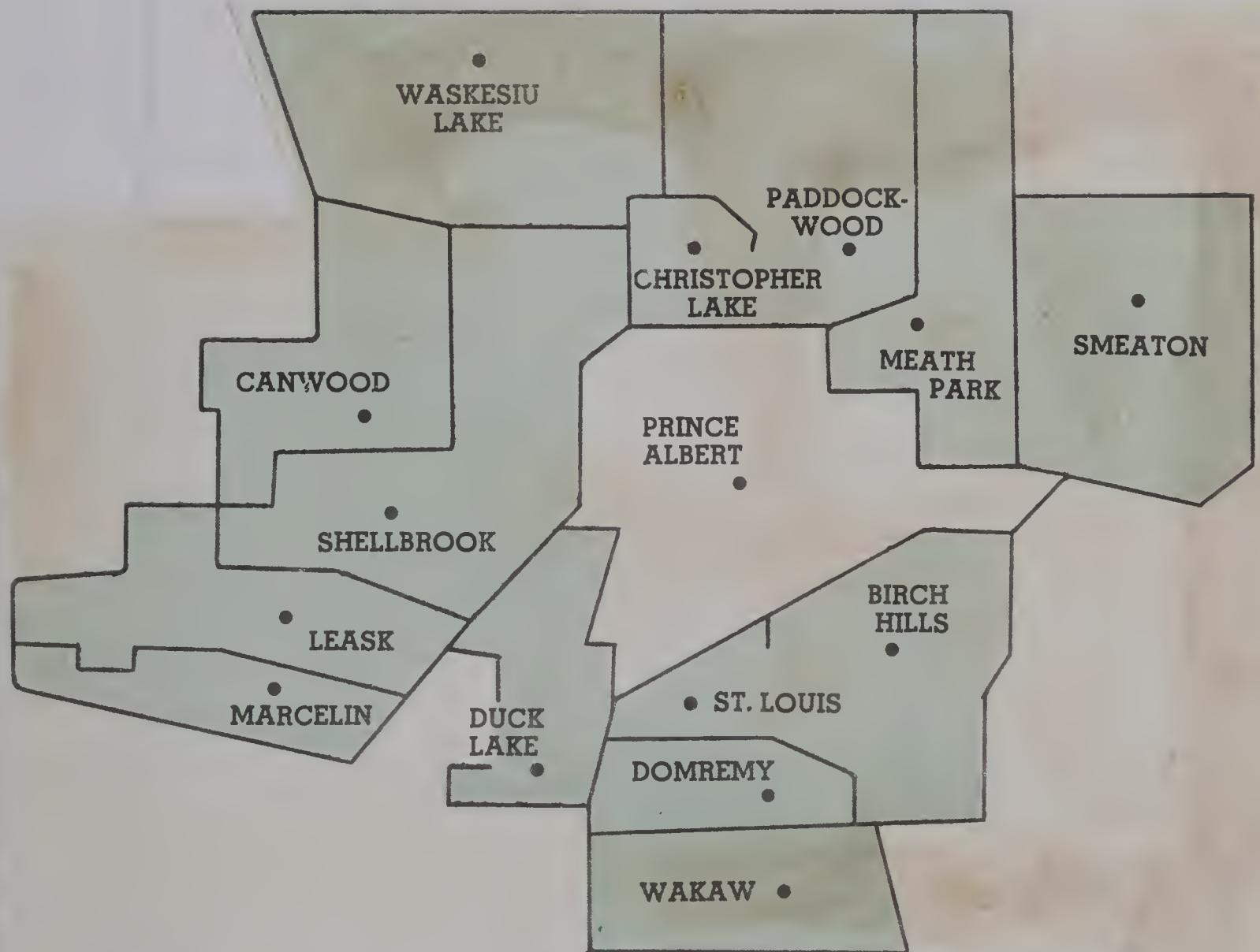


Figure 4. Sample Configuration of Telephone Exchange Areas--Prince Albert Trading Area

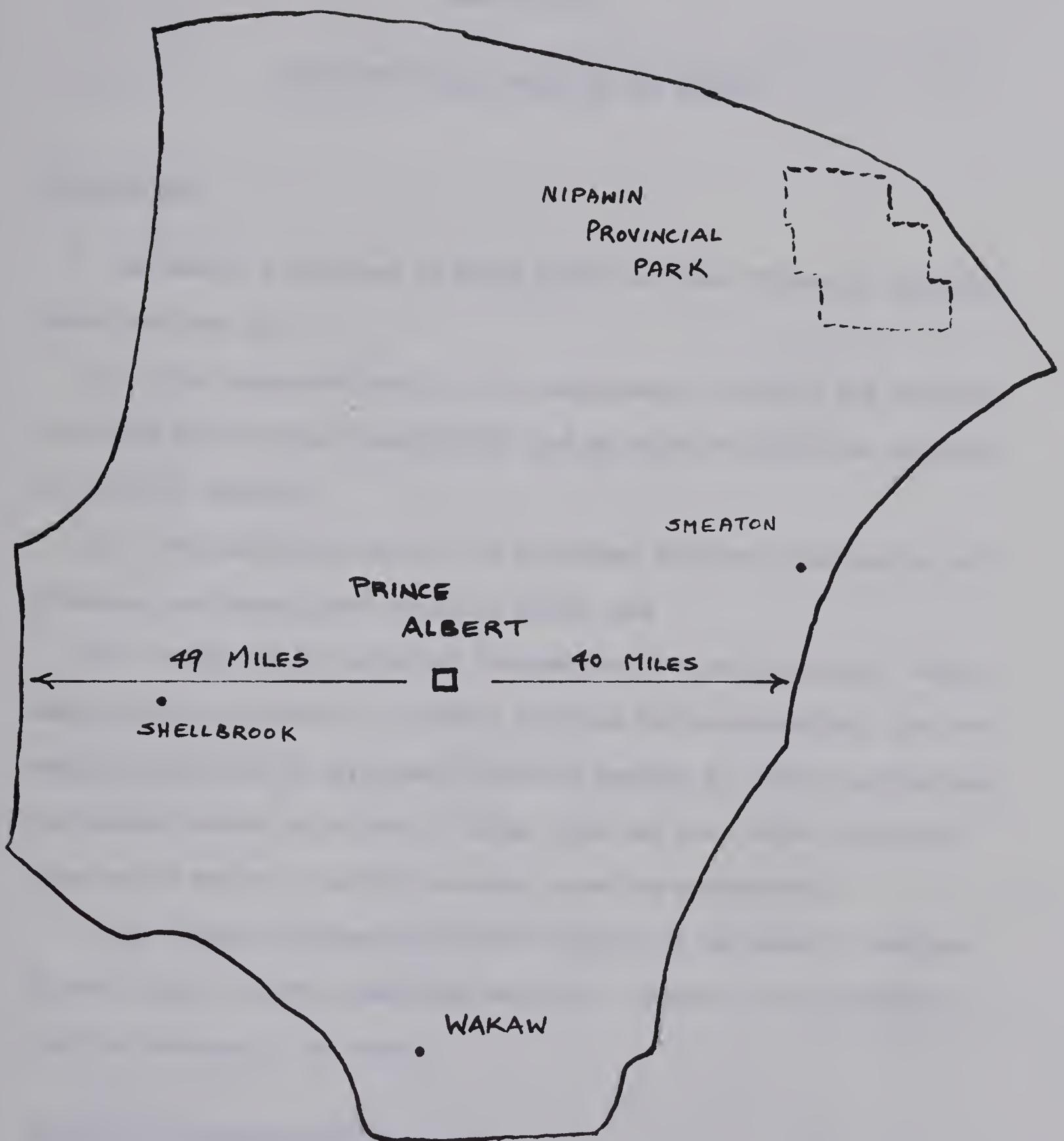


Figure 5. Sample Trading Area--Prince Albert

CHAPTER III

THE CONCEPTUAL BASIS OF THE MODEL

Introduction

The model is composed of three basic sections (Figure 6, page 23).

These sections are:

(a) The conceptual basis of the experiment, in which the decision criterion and role are constructed, and in which the model is analyzed in terms of validity;

(b) The identification of the pertinent factors, construction of formulae, and operational decision rules; and

(c) Design of the detailed information flow and analysis. While subdivided for analysis, the three sections are interrelated. For example, sales data on previously Zenithed regions is used in estimating the average value of an order, rather than the test value. This increases the extent to which the results may be generalized.

This chapter discusses the first section of the model. Chapters IV and V deal with the remaining sections. Chapter VI is concerned with the testing of the model.

Decision Criteria and Rule

The model assumes three corporate objectives concerned in the evaluation of this marketing tactic.²⁰ These objectives are:

Conceptual basis of experiment

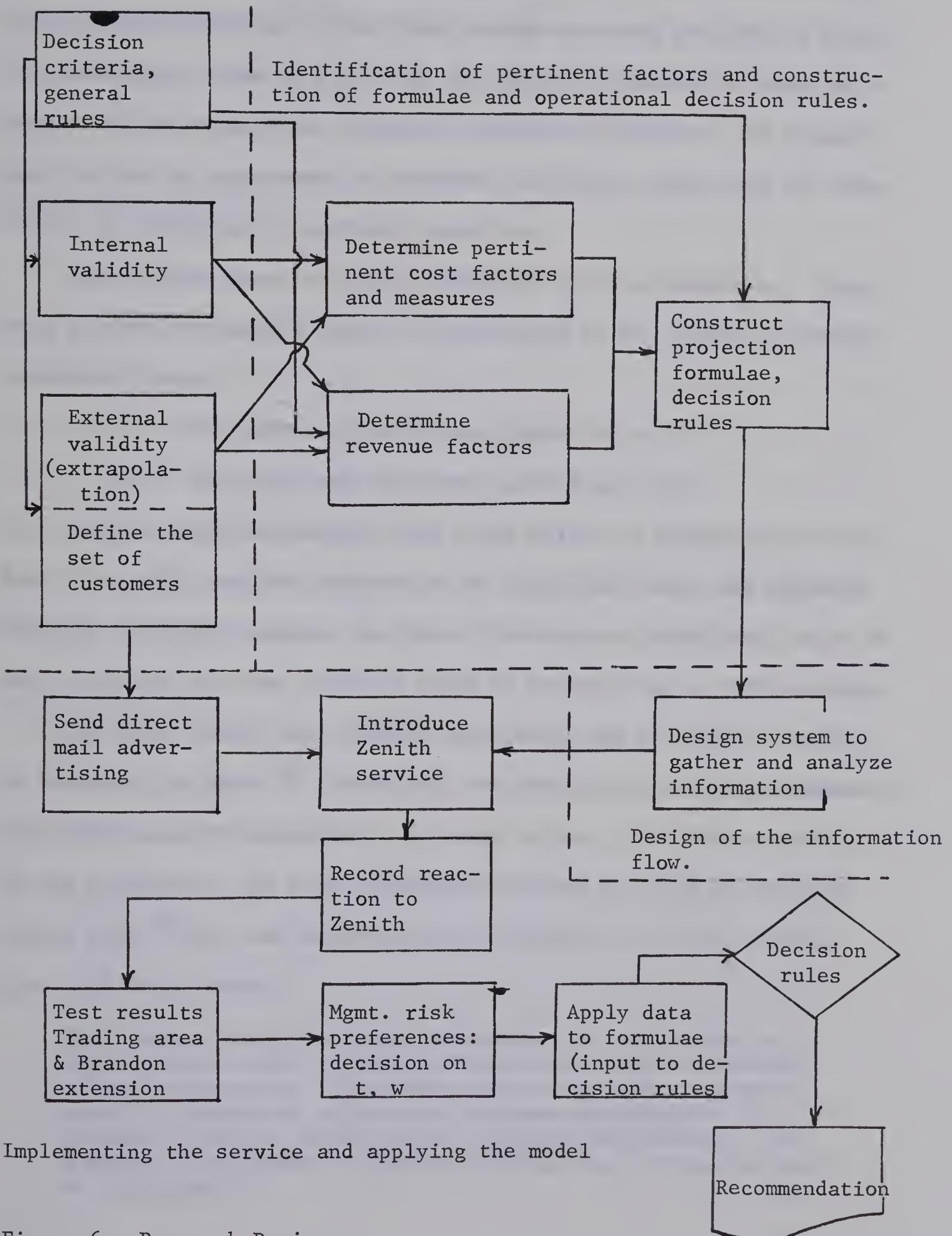


Figure 6. Research Design

short-term profit; maintenance/growth of sales; and the strengthening of customer relations.²¹ The first two are measured in terms of potential additional sales and profits, the second is assumed to occur as a result of a more personal service in answering inquiries. No measurement is made on improvement of customer relations, other than the tabulation of the number of customer inquiries.

Given these three criteria, a decision rule is formulated. This rule is that the service would be implemented if one of the following conditions is met.

- (i) The projected additional profit is ≥ 0 ;
- (ii) The projected additional profit is < 0 ;

the variable costs are covered (the costs which are incurred as a result of a call), and the combination of additional sales and improved customer relations warrants the loss. The ratio of additional sales to sales required to cover variable costs is referred to as risk coverage.

The study itself only reduces uncertainty and the risk of making an incorrect decision.²² Therefore, the model incorporates management's risk preferences to compensate, at least in part, for the uncertainty of the situation. The risk preferences reflect not only an attitude toward risk,²³ but also other subjective factors. In this context, Cyert and March state:

Expectations are by no means independent of such things as hopes, wishes, and the internal bargaining needs of subunits in the organization. Information about the consequences of specific courses of action in a business organization is frequently hard to obtain and of uncertain reliability. As a result, both conscious and unconscious bias in expectations is introduced.²⁴

The risk preferences are introduced by asking management to designate acceptable probability levels for two of the factors used in the extrapolation. Thus, the data introduced into the decision rules are characterized as being at an acceptable level of risk.

Evaluation of the Model

Campbell and Stanley have categorized sixteen experimental designs into three types, and have analyzed each design with respect to validity of inference.²⁵ The types of designs are: pre-experimental, true experimental, and quasi-experimental. The analysis is in terms of internal (the establishment of a cause-effect relationship) and external (the extent to which results can be generalized) validity. Rather than attempting to fit the model into any of the designs, the writer will analyze the design in terms of internal and external validity.

External Validity

The concepts of internal and external validity are closely related. As Banks has pointed out:

. . . the effects of internal and external validity variables may work at cross-purposes. Laboratory experimentation usually means greater control over factors affecting validity, but it raises the whole issue of the ability of the experimenter to extrapolate from his precise laboratory situation to competitive conditions of the real world. Experimental design which maximizes control over factors affecting external validity may not provide sufficient internal validity, or may result in experiments under which it is hard to measure internal validity. Obviously, the researcher's goal should be the creation of a design for each particular problem which will be strong in both types of validity.²⁶

This section considers the basis chosen for extrapolation, and the extent to which the test regions approximate the "real world" competitive and economic conditions. To aid in the discussion the following diagram (Figure 7) is presented.

Three problems concerning external validity are apparent.

1. The selection of criteria which define "customer" (the basis of extrapolation).
2. The control and adjustment of "noise" resulting from the design in which the test set is not "closed." ("Noise" refers to the intervention of extraneous variables.) This problem of entrance (and exit) from the test set affects (1) above, and is discussed under the heading "Temporary Competitive Advantage" in the section on internal validity. The temporary competitive advantage involves problems of extrapolation, which, while directly related to external validity, derive from problems of internal validity. For a smoother flow of discussion, this aspect of external validity has been discussed as part of internal validity.
3. The difference between the test environment and the "real world" (simulation).

Selection of criteria

Given the objective of measuring response of a set of people who could be termed "Eaton's customers" (in order to nullify the effects of a temporary competitive advantage), the desired set for external validity would be those who received the 1968 Fall and Winter book. This catalogue of 780 pages is sent out only to the steadier customers.

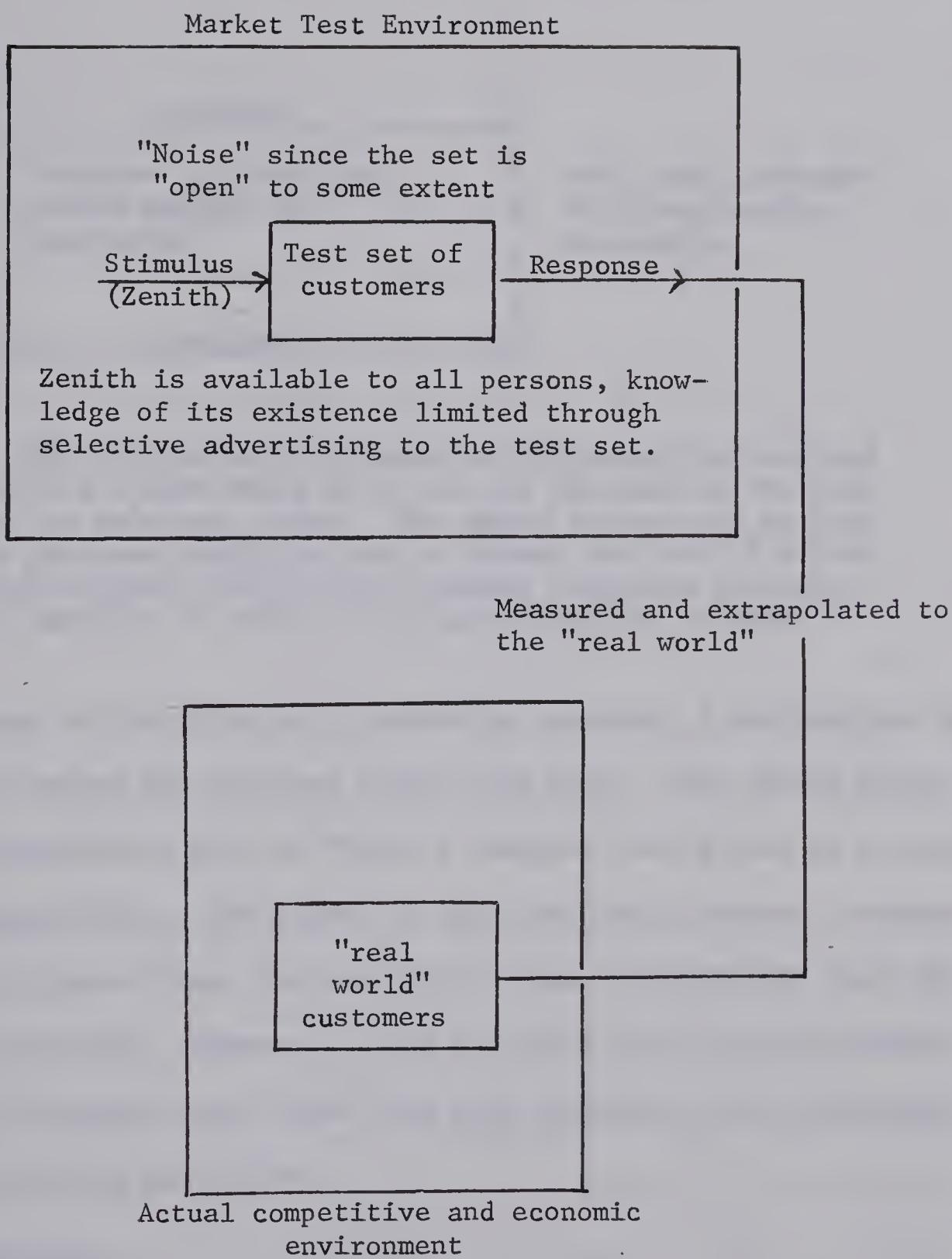
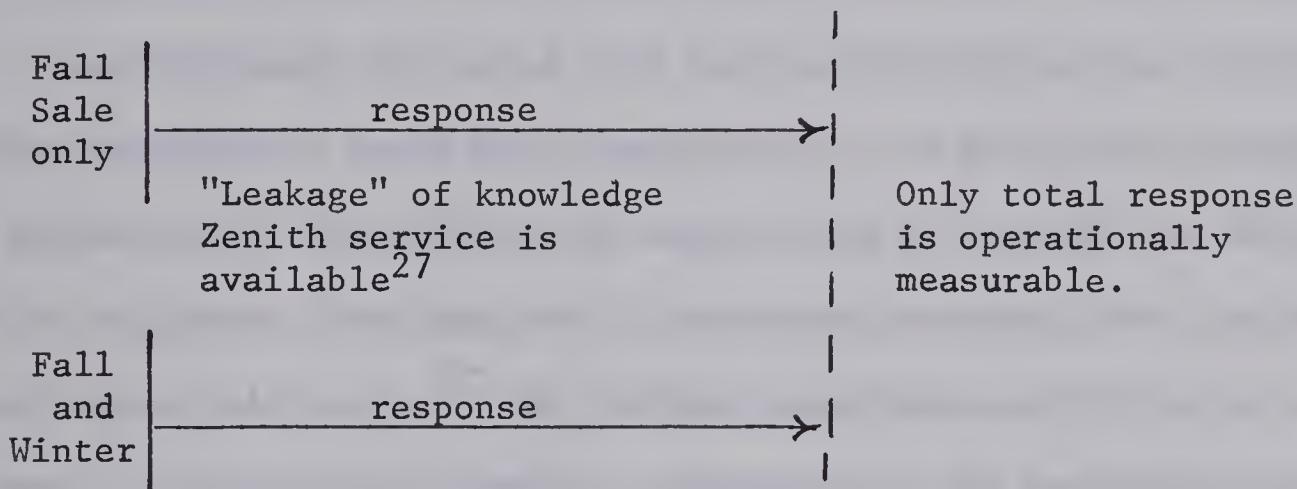


Figure 7. Openness of test set.

There are, however, many other smaller books and fliers distributed to persons outside this category. The reason why the Fall and Winter book was not used as the criterion is due to the problems of maintaining internal validity. The diagram below should aid in this discussion.



The only method of separating customers who received the F & W book would be to ask the customer at the time of the telephone order. This would be expected to lead to problems resulting from a request for the F & W book. Such requests could cause customer relations problems in addition to those of the interpretation of data.

Because of this problem in measuring response, a customer was defined as a person who receives a Fall Sale book. This choice would further the probability that an "Eaton's customer" would also be a customer of Simpson-Sears. The reason is that the less a customer purchases from one of these firms, the probability that she purchases from the other is increased. However, it was felt that the trade-off between the error resulting from "noise" and that resulting from overlapping customers favored the latter.

Simulation

The question of correlation between the test environment and the "real world" can be considered in two parts. The first is the

simulation of a market in which Zenith is advertised in such media as the press and radio. The second part deals with how well the five test regions represent the Provinces over-all, in terms of environmental conditions, the most prominent of which are the competitive and economic factors.

As previously discussed, the initial advertising was restricted to those persons who would have qualified for the Fall Sale catalogue.²⁸ A second set of advertising was sent out as an "insert" in the Winter Sale catalogue. The same set of categories received both the Fall Sale and Winter Sale books.²⁹ No further promotional activities were undertaken. This detracted from the simulation of the marketing environment should Zenith be introduced on a "blanket" scale.³⁰ It is expected that this restriction of advertising would underestimate the sales/profit potential. Since the risk coverage is independent of the number of calls, one of the major conditions of the decision rule is not affected. Further, the decision rule incorporates information from the records system to supplement the experimental data on the number of calls.

The second problem, that of representativeness, arises from the use of a limited number of test regions, and from the non-randomness of the method of selection. The reasons behind these constraints were discussed on pages 12 and 13. The experimental design does partially compensate for non-representativeness. As mentioned in the paragraph above, risk coverage is independent of the number of calls. Further, the proportion of order calls (t) and of new order calls (w) are

expected to be independent of region; and the value of an order is estimated using sales data accumulated from regions which previously had the service (hereafter referred to as PZ areas) and using 't'.³¹

Whether or not a customer resides within a trading area in which Eaton's has a CSO may affect her reaction to Zenith (specifically, the number of calls). To account for this possibility, the test regions have been treated as representing two market segments. One segment, represented by the combined trading areas, is abbreviated to ETA; the other, as represented by the region in the Southwestern corner of Manitoba, is abbreviated to NETA.³² Separate calculations are made for each of the segments, and are combined only when the total additional profit is computed.

Internal Validity -- History

Introduction

[History] is the flow of events taking place in the outside world which might change people's awareness of, or reaction to, the subject under research investigation History deals with events external to our experimental design but which affect most, if not all, of the people involved in the research plan.³³

In the model, sales in the test set of customers should be compared with a control group subject to the same changes in the competitive, economic, and other environmental conditions. This aspect is dealt with in the discussion on measurement of transferred business.

Perhaps unique to this experiment is the difficulty of isolating the defined set of customers due to the dissemination of information on the service. This source of interaction with the population is

discussed in the treatment of the temporary competitive advantage.

To measure the additional sales attributable to the Zenith service, the following anticipated effects of the service are considered.

1. Gross Telephone Sales (GTS).

2. The transfer of business from CSO counter (T/B CSO) and direct mail (T/B DM) to telephone sales. The reasons for making the distinction between DM and CSO are discussed on the next page.

3. The temporary competitive advantage (TCA).

4. The transfer of business in place (T/B/P).

5. The transfer of business in time (T/B/T)³⁴

The additional sales = GTS - T/B CSO - T/B DM - TCA - T/B/P - T/B/T

where:

T/B CSO = control (CSO counter) - actual (CSO counter)

Control is an estimation of what CSO counter would have been if Zenith had not been introduced.

T/B DM is analogous to T/B CSO.

TCA = 0 by isolation of test customers and adjustments where necessary.

T/B/P = 0 by assumption.

T/B/T = 0 by length of test period, and by assumption.

Measurement of transferred business

In measuring the amount of additional business, the total transferred business (DM + CSO) could have been found. The total has been split and analyzed separately for two reasons.

One reason is that the transference in methods of ordering could have significance for such marketing tactics as methods of promoting

the service.³⁵ The second is that some of the orders transferred from placement at the CSO (and generally pickup) to telephone ordering, would be delivered direct to the customer. Therefore, the cost of the T/B is increased not only by the long distance charges but also by a portion of the difference in costs of delivery between CSO and DM.

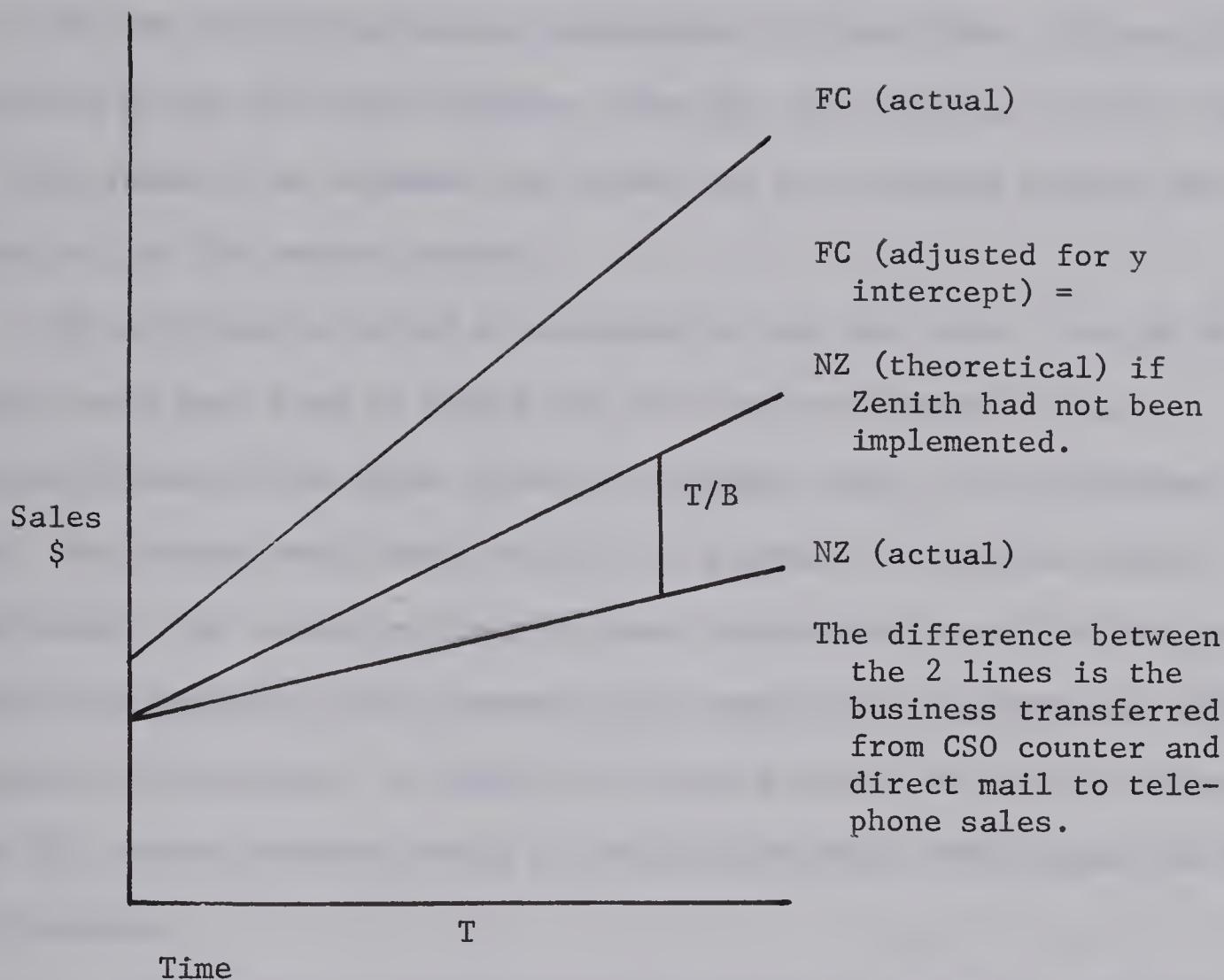
This difference per order, is the major difference in processing costs.³⁶

Ideally, then, both DM and CSO should be measured in terms of inputs (for the first reason) and in terms of outputs (for the second). Operationally, however, only outputs can be measured. The inputs (customer's orders) are not sorted by towns, and consequently are not in a useful form for analysis. The costs of implementing a sorting procedure could not, in the writer's opinion, justify the benefits derived from the information.

Conceptual basis of measuring transferred business. In discussing sales, unless otherwise stated, the writer is referring to the total of CSO counter and direct mail sales.

The basic assumption underlying the model is that the rate at which the volume of business increases in the FC area is the same as the rate which would have existed in the corresponding areas, if the service had not been implemented.³⁷ Hereafter New Zenith is referred to as NZ.

In this respect, the FC area acts as a "control" to monitor the changes in Eaton's competitive strategies, and in the competitive and economic environments. The particular interest is in changes in the environment rather than their magnitude per se. For example, the



competitive environment of the FC area is likely different from that of the NZ area, due to the presence of larger and more numerous local shops in the town. However, given a set of tactics, used by the competition, the trend of Eaton's business would be expected to be the same for both the FC and NZ regions. Error is introduced if changes in competitive tactics result in a disproportionate response, that is, if the ratio of new business to previously-held business is not the same for both the FC and NZ areas. If the results are proportionate, it is expected that the assumption is valid. It is anticipated that the argument is stronger for the economic environment since the economy of the

FC and NZ areas would be expected to have the same base.

The two sets of curves are calculated for both (DM + CSO) and CSO for each of the five test regions. The data for the four trading areas is then combined to estimate the values for the relevant revenue factors for the ETA market segment.

The alternative method of determining what the sales from the NZ areas would have been if Zenith had not been introduced, is the extrapolation of the sales trends of previous years. It is believed that this method would have resulted in a greater error than that of the model. The reason is that the past trends could not take into account developments in the economic (and competitive) environment during the year of the test. In effect, the Zenith impact on the direct mail and CSO counter business would be indistinguishable from changes in the environment.

Mathematical calculation of transferred business. The data gathered would thus be in three sets -- FC, NZ, and the areas which previously had Zenith service (hereafter referred to as OZ).³⁸ Each set would also be divided into either CSO or DM. The OZ region is excluded in evaluating the effectiveness of Zenith for two reasons. The first is that two of the four test sites do not have such regions, and the second is that the advertising into the regions would be expected to increase the telephone business and thereby increase the slope of the trend line of the FC. The effectiveness of the advertising, and therefore the potential additional sales of other such OZ regions, is being evaluated in Winnipeg.

The data, gathered weekly over 26 weeks, cover the busiest time of the year for retailers. To dampen the variability due to such factors as pay period, the data may be gathered into two-week groupings.

The first step in measuring the volume of transferred business is to establish the equation of the trend lines. The data are plotted by period, and the nature of the trend (either straight line or curve) is visually determined. On this basis the equation is derived, and is tested for completeness of the accounting for variation by finding the ratio of the explained to the total variation. If the amount of explained variation is insufficient, the next higher polynomial would be derived. The methods for derivation and testing for completeness are given on pages 70-73.

In order to find out what the trend of the new Zenith would have been, the method outlined below is followed. An example is used to clarify the solution. It should be expected that the trend lines will not have the same value at the ordinate and will have to be adjusted prior to ascertaining the difference. Thus, if the equation for the free call area is:

$$y = 10 + x + x^2 \quad (1)$$

and the one for the new Zenith is:

$$y = 5 + 1/4x + 1/4x^2, \quad (2)$$

then the first step is to divide the first equation by 2 to obtain the same intercept. Thus equation (1) is expressed as:

$$y = 5 + 1/2x + 1/2x^2 \quad (1)$$

which is the equation of the trend if Zenith had not been introduced.

The difference then is the transferred business in equation form and is:

$$y = 1/4x + 1/4x^2 \quad (3)$$

The transferred business for any period is found by substituting the number of the period in the equation. The total difference is the sum of these differences. The information would be recorded on the "transferred business" form (Exhibit 12).

The basis of comparison, and determination of differences, is illustrated below.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
x	y	Δy	$(3) \div (2)$	y'	$\Delta y'$	$(6) \div (5)$
1	12		1/3	6		1/3
		4			2	
2	16		3/8			3/8
		4			3	
3	22		4/11			4/11
		6			4	
4	30		8			

where $y = 10 + x + x^2$

$$y' = 5 + 1/2x + 1/2x^2$$

The trend is essentially described in terms of the percentage increase or decrease over the value for the particular period and concomitantly the ratio of the increase to the initial point where $x = 0$. Thus, the adjusting of the free call to the intercept of the new Zenith establishes the basis for comparison. As shown in the table on the previous page, the rate of increase as measured by a percentage of the y value has not been changed by dividing by 2.

While it is acknowledged that each of the regression curves has a confidence band around it, they have not been used in the analysis. The reason is that since the T/B is found by adjusting the free call to the new Zenith, and since the regression curves would have the same basic relationship, the magnitude of the resulting T/B would be the same.

Transference in method of delivery. The effect of the service on the transference in method of delivery can be calculated as follows:

Let telephone sales = \$N

of these \$N let \$M be sent out DM

. . . \$ (N-M) is sent out via CSO

Let the T/B DM as measured by outputs = \$P

Let the total T/B = \$T

. . . \$ (T-P) is T/B CSO

The following table is then constructed:

	Actual T/B	Expected T/B	Difference
DM	P	$T\left(\frac{M}{N}\right)$	$P-T\left(\frac{M}{N}\right)$
CSO	$T-P$	$T\left(\frac{N-M}{N}\right)$	$(T-P)-T\left(\frac{N-M}{N}\right)$
Z	T	T	0

The difference represents the change in the method of delivery.

(i) if $(T-P-T\left(\frac{N-M}{N}\right))$ is (+) the interpretation is that customers in transferring their orders from CSO counter to Zenith also

transferred their method of delivery from pickup at the CSO to DM, thereby increasing costs:

(ii) if the above is (-) then vice versa;

(iii) if = 0 then there was no change.

The implication of this to the model is that we cannot merely calculate our additional sales, then find the variable costs for these sales. The T/B also has a cost factor -- the difference in costs between DM and CSO for the volume $(T-P)-T\left(\frac{N-M}{N}\right) = T\left(\frac{M}{N}\right) - P$.

The ratio to be used is $T\left(\frac{M}{N}\right) - P/T$ and is designated as H in the extrapolation formula.

Temporary competitive advantage

The effect on the distribution of sales has to be either measured or eliminated, since the concern is with additional business over the long run. Therefore, the tactic must deal with data from people who could be classified as Eaton's customers. The reason for this is that Zenith is a service available from the telephone company at a relatively low fixed cost, and it is a service which cannot be differentiated in any way. It is therefore unlike such competitive tactics as improving the merchandise selection and/or quality, or entering a new market. Thus, the effect of the temporary competitive advantage (principally over Simpson-Sears, the only serious catalogue competitor) must be either measured or eliminated as a variable.

The following describes some of the operations and terminology which will be necessary in the discussion. The Catalogue Distribution Department maintains records on purchases by customer by period, used

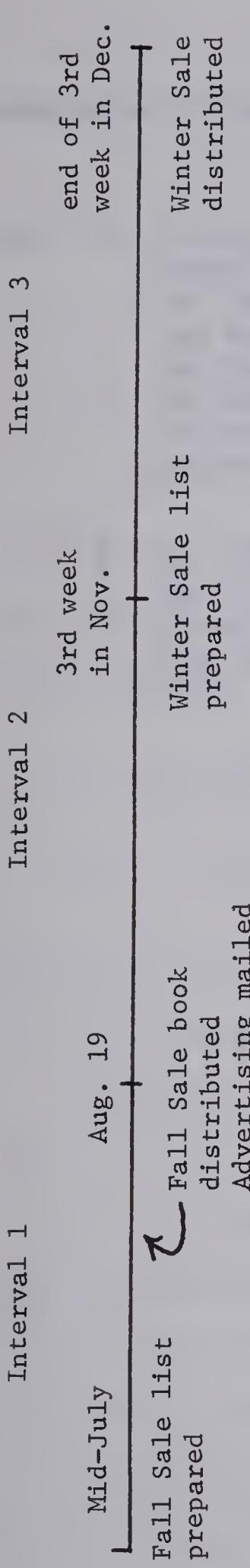
in compiling the mailing list. The criteria for distributing the various catalogues are based on the historical distribution of the purchases.

The purchasing patterns³⁹ are categorized, and the criteria for distribution of a particular catalogue (i.e., which categories will "qualify") varies with the catalogue. Thus, while most customers on file will receive catalogues such as the Fall Sale book, a smaller number will receive the larger Fall and Winter book. There is a small (about 3-5%) percentage of customers on file who "quality" for few, if any, catalogues. After a given period of time, such people are dropped from file. Customers ordering for the first time (or for the first time after their records have been dropped from file) are termed "new names." In addition to the direct mailing, some catalogues are shipped to the CSOs where they are available upon request. It should be noted that Winter Sale books thus distributed would not have the advertising insert.

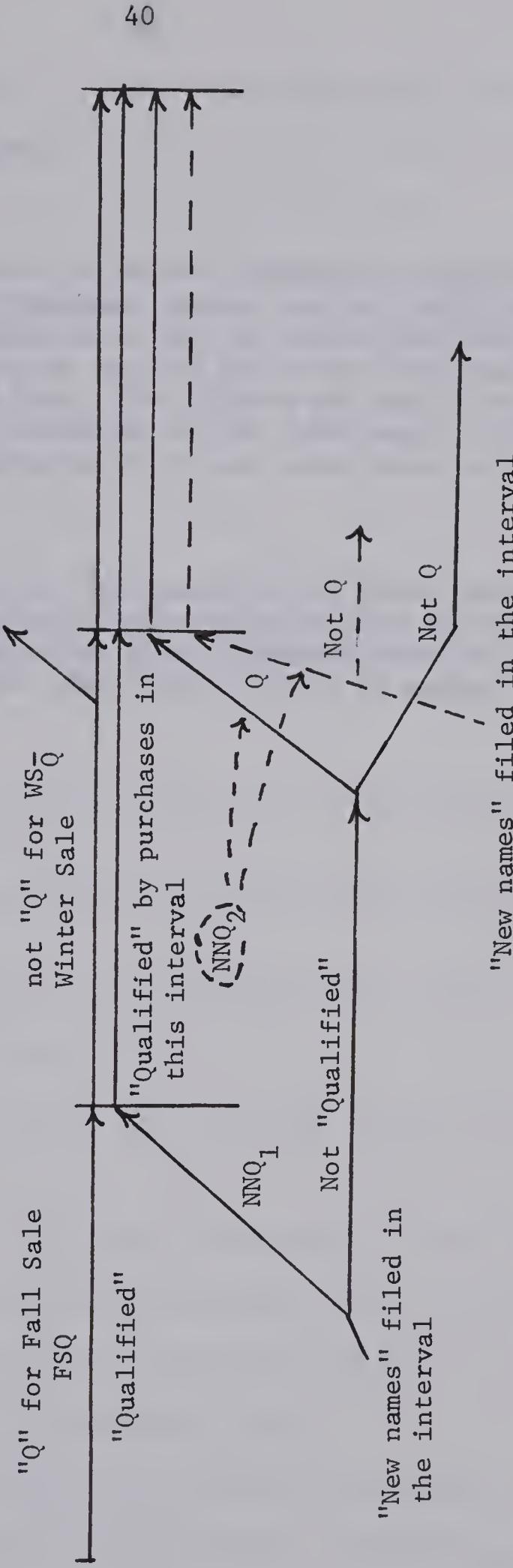
As mentioned, the set classified as Eaton's customers were defined as those who qualified for the Fall Sale catalogue. Under ideal circumstances, the test population would have been restricted to this same set. The extrapolation should be based on the same criteria which were used in defining the test set.⁴⁰

However, interference due to inclusion and deletion of names into this set entered into the test. The sources of the interference are depicted on the following page. This diagram should aid in the following discussion, which examines the implications and impact of the interference.⁴¹ The following abbreviations are used in the discussion:

Time →



The above represents the "ideal" situation, in which the same set of customers is maintained throughout. The diagram below indicates the actual situation.



"New names" filed in the interval

Addendum to previous diagram:

- Note: 1. In addition, there is the set previously mentioned on file, but whose purchase history was not sufficient to "Qualify" (denoted by OR_Q ; but whose purchases during the intervals do qualify for advertising and/or the Winter Sale book. The effects are not shown above, but they would be similar to the "New names." Because its size is negligible it is not considered in the analysis.
2. The first orders of "New names" filed after the mailing of the advertising were excluded from the analysis. Subsequent orders from these customers were included. This would remove some of the effects of random sales.

FSQ: the set of people who received the Fall Sale book,
 NNQ_1 " the set of people who did not receive the Fall Sale book,
 but who did receive the mailed advertising,
 NNQ_2 : the set of people in neither FSQ nor NNQ, who did receive
 the Winter Sale book,
 TWS: the set of people who received the Winter Sale book, and
 WS_Q : those in FSQ who did not receive the Winter Sale book.⁴²

In order to make a valid extrapolation, an adjustment for the interference is made. The test period is divided into the interval before, and the interval after, the Winter Sale book is distributed. The adjustments are:

- (1) $\frac{FSQ}{FSQ + NNQ_1} \times$ additional sales in the former interval⁴³
 and
- (2) $\frac{FSQ}{TWS} \times$ additional sales in the latter interval.

The sum of (1) and (2) above is the total additional sales attributable to the set FSQ in the test period.⁴⁴

In making these adjustments, the following assumptions have been made:

(a) In equation (1), the implicit assumption is that FSQ and NNQ_1 have common purchasing patterns. The argument will be made that this assumption is not unreasonable, and that variance from it will result in a conservative estimate of additional sales.

In some cases the set NNQ_1 would contain families who had previously purchased from Eaton's. Consequently, random behavior as a factor could be eliminated and a relatively stable buying pattern

expected. The assumption of similar buying patterns implies equal accessibility to catalogues. Since it would be expected that for the most part people in the set NNQ_1 would have less accessibility than those in the set FSQ, it is reasonable to conclude that they would purchase less.

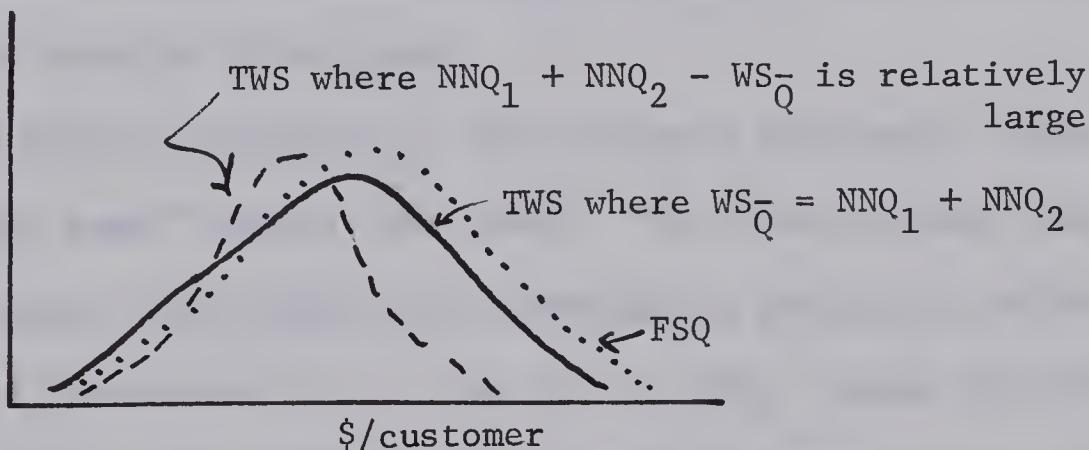
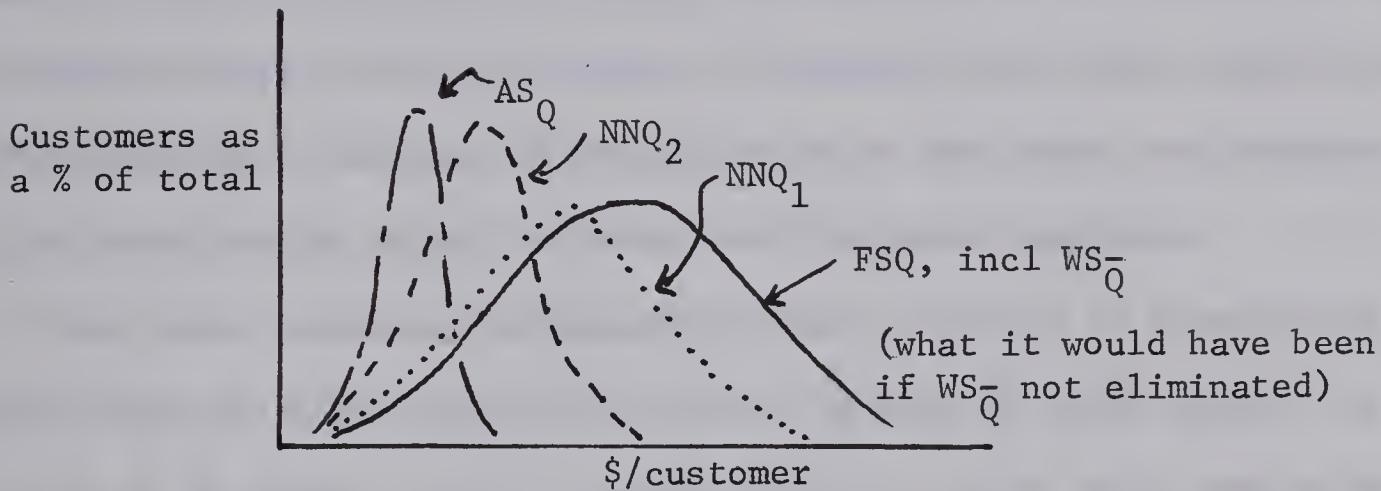
Thus, the adjustment would be expected to lead to a conservative estimate of additional sales. Because NNQ_1 is not expected to be large in proportion to FSQ, the error in estimation is not considered large enough to invalidate the assumption. Since both $(FSQ + NNQ_1)$ and FSQ are known, NNQ_1 can be calculated and the expectation regarding its size verified.⁴⁵ Further, in the case of a marginal decision, in which the number of calls becomes the critical factor, the records of previously Zenithed regions would supplement the test data.

(b) In equation (2) ($((FSQ \div TWS)$ (additional sales in the interval between the distribution of the Winter Sale book and the end of the test period)) the assumption is that FSQ and TWS have common purchasing patterns. This assumption will now be analyzed.

Since $TWS = FSQ - WS_{\bar{Q}} + NNQ_1 + NNQ_2$, then the difference between TWS and FSQ ($TWS - FSQ$) = $NNQ_1 + NNQ_2 - WS_{\bar{Q}}$. The difference is negligible if $WS_{\bar{Q}} = NNQ_1 + NNQ_2$ (in numbers); and if the purchasing patterns are similar. This latter condition is clearly incorrect since both NNQ_1 and NNQ_2 have purchased more than has $WS_{\bar{Q}}$ in order to qualify for the Winter Sale book. With the aid of the diagram below, the impact of this difference in purchasing pattern will be examined.

Probable Sales Distribution of Additional Sales

It would be expected that FSQ would have a higher mean than NNQ_2 or NNQ_1 since FSQ would have had repetition in advertising as well as longer and more stable buying history.



(Each curve is supposed to have same area under it = 100%)

It can be seen, then, that the error in the assumption becomes largest "liberally" when $WS_Q = NNQ_1 + NNQ_2$; and would be minimal "liberally" and possibly "conservative" when $WS_Q = 0$. It is likely that WS_Q would be quite small, due to the aggressive marketing practices of the Company. Should the difference between $NNQ_1 + NNQ_2$ and WS_Q be large, it is possible, given a distribution similar to that shown in the diagram, the error will be on the conservative side, since

FSQ x $\frac{\text{additional sales}}{\text{TWS}}$ = adjusted additional sales, and the mean additional sales for TWS would be lower than that for FSQ.

The impact of the assumptions can be partially measured by calculating NNQ_1 , NNQ_2 , $WS_{\bar{Q}}$, FSQ, and TWS in terms of numbers of customers. However, it is not possible to argue conclusively on the nature and relationships among the distributions. This would have been possible had a distribution by category been made prior to the study, and compared to the distribution after the field test had been completed.

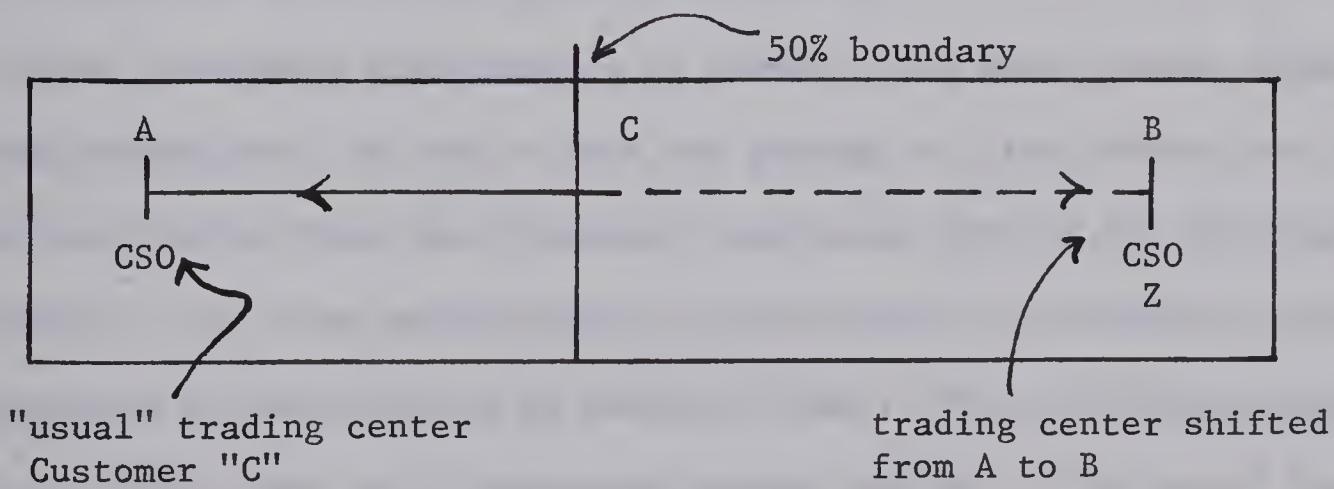
The error, whatever its magnitude, can be placed in perspective by noting that the time period for which it is made is seven weeks, out of a total of 26 weeks, with the concentration of sales being made prior to Christmas (in terms of \$ per week).

The design limited knowledge to those already mentioned; however, it is likely that some "leakage" did occur. The impact of such leakage which would indicate some competitive advantage is partially indicated by the growth of "new names," i.e., the size of NNQ_2 . Under the major assumption underlying the methodology, it would be expected that the growth of "new names" in both the FC and NZ areas would be proportional in terms of their respective FSQ volumes. Given the assumption, the differences between expected and actual could be attributed to the impact of "leakage." The data for such a comparison can easily be calculated. While the initial orders of the "new names" had been excluded from the sales analysis, the source documents were stored separately, and the numbers of such customers could be used in the comparison.

If the set NNQ_2 did show sufficient competitive advantage due to the Zenith that it was thought necessary to make a further adjustment, this could be done by adding it, or a portion of it, to the denominator of equation one.

Transfer of business in place

One difficulty which has been mentioned is the probabilistic nature of the trading area. The problem arises since Eaton's customers from the trading area of a trading center may be also, but to a lesser extent, customers of other trading center(s); there is a possibility of transference as shown in the diagram following.



Two problems could arise.

1. CSO (as measured in output) business at "A" could drop, with this loss going unrecorded. Because of the method of recording data, in which source documents are recorded by location of customer, this presents no problem.
2. Because of transfer in place, the method of delivery shifts from CSO pickup to DM. That this problem is negligible is argued by suggesting that as the distance to the trading center increases, the

probability of CSO pickup decreases, so that "C" seldom picks up goods at the CSO; and that since telephone ordering is similar to direct mail ordering (both originating at home), even if "C" telephoned "A" the probability of CSO pickup is low. Further, the selection of test sites at Kindersley and Roblin were predicated on isolation. However, the problem could occur with the trading area around Brandon and Prince Albert.

Internal Validity -- Maturation

This term covers all those biological or psychological processes which systematically affect people with the passage of time, independent of specific outside events.⁴⁶

Banks interprets this concept in terms of the more classic forms of experimentation. In such a case the passage of time between two observations, rather than the treatment, may cause some of the difference in results. The first application of this concept to the model is the transference of the reaction to Zenith in time. That is, people make purchases which they would have made anyway, but which they would have delayed. This source of interference has been dealt with, although not isolated and measured, by extending the analysis for 26 weeks covering the busiest retail periods. Further, by covering the "Fall Season," and excepting non-seasonal goods such as toiletries, this transference is negligible if the additional purchases are made with a time horizon of less than one year. This time horizon is felt to be quite realistic.

The second application of the concept is that the pattern of customer reaction may change as the consumer becomes accustomed to the

service. Thus, as customers increase the frequency of calls, the proportion of calls resulting in an order and/or the proportion of new order calls may decrease. This is adjusted for by finding the relationship between the number of calls, and the two proportions mentioned above.⁴⁷ The long-run number of calls, estimated from data as seen with previous Zenith service, as well as the test data, is used to re-estimate the two proportions.⁴⁸

Internal Validity -- Testing

Banks defines testing as "learning or mental conditioning of our test units which arises as a result of a pretest or first measurement."⁴⁹ He further warns that the measurement must be passive, that is, it must not influence the response.

The input information from the customer is recorded by the clerk taking the sales order. The instructions stipulate that the customer is not to be asked whether she is using the Zenith service (Exhibit 16). Consequently, the method of measurement is passive.

Internal Validity -- Instrumentation

Banks defines this as "changes in the measuring instrument which might account for the differences between two measurements."⁵⁰

In terms of the model, this could be interpreted as differences in the recording procedure by the four CSOs concerned. Each CSO was sent the same set of instructions (Exhibits 16 and 17) and each was monitored, by both personal contact by the experimenters and the District

Sales Supervisors, and by analysis of the incoming information. The calls as recorded by the CSO are compared to the monthly report sent by the telephone company to monitor for completeness in the recording of the number of calls. Any deviations would be pro-rated on the basis of the recorded data. It is therefore felt that instrumentation is not a factor in this experiment.

Internal Validity -- Statistical Regression

This factor relates to experiments in which people are included in the test sample, due to some extreme behavioral characteristics, such as having purchased an inordinately large quantity of a product.⁵¹ This factor does not apply to the model.

Conclusion

This chapter has dealt with the conceptual basis of the experiment. It is felt that a realistic decision rule has been presented, based upon multiple criteria and incorporating management risk preferences. The results, therefore, are characterized by acceptable risk.

The major portion of this chapter has been the analysis of the model in terms of internal and external validity. The implicit questions are: (1) Does the model establish a cause-effect relationship, and measure it adequately? and (2) Can the results be extrapolated? The analysis has indicated that there are indeed many deviations from an ideal standpoint. Most of the deviations have been partially

adjusted for by invoking additional information extrinsic to the experimental situation. Further, some deviations may not result in distortion of the pertinent information. The writer believes that, given the practical aspects of this field experiment, it does provide information of sufficient validity for the purposes for which it was constructed.

CHAPTER IV

FORMULATION OF COST-REVENUE FACTORS
AND EXTRAPOLATION FORMULAE

Introduction

The extrapolation deals with the calculation of the additional sales, the variable costs, the difference between these (the variable profit), and the total additional profit (variable profit less fixed cost). As mentioned previously, there is a question with respect to differential reaction to Zenith, depending on whether or not a customer resides in a trading area.⁵² Thus, the extrapolation in effect consists of two separate extrapolations, one for each of the market segments. This necessitates separate calculations for the first three parameters mentioned above.

Of the six factors whose product is the additional sales, four are calculated for each of the market segments. Of the five cost factors, four are given separate treatment. The procedures for calculation are the same. Only the input values are different. While some of the factors, such as cost of goods sold, are dealt with in their entirety in this chapter, only a broad description is given of others which require greater depth of treatment. These latter factors are discussed in the following chapter, which is concerned with operational detail.

Revenue Factors

The potential annual revenue is the product of the following six factors. The "S" and "D" following a factor indicate a separate calculation for the two market segments, and a more detailed discussion in the following chapter, respectively.

- (a) Catalogues in the potential new Zenith regions (S)
- (b) Calls/catalogue/year (response) (S) (D)
- (c) Portion of calls resulting in orders (S) (D)
- (d) Portion of order calls resulting in new orders (S) (D)
- (e) Average gross value per telephone order
- (f) Factor for reducing gross value to net

Catalogues in Potential New Zenith Areas (c)

As previously mentioned, the set of customers receiving the Fall Sale book is used as the basis of projection. This involves two implicit assumptions.

(i) The ratio of Fall and Winter (FW) to Fall Sale (FS) catalogues holds for the over-all proportion in the potential new Zenith regions. As such, it is concerned with the problem of representativeness. The assumption can be tested using catalogue distribution records, and any deviation is expected to be slight, due to the size of the test set. The implications involve the effect on response and on order value.

As previously mentioned, the variable sales to cost ratio is independent of response; and the response itself is expected to be underestimated. No adjustment is undertaken on the basis of the FW:FS ratio

as no quantitative basis appears to exist. The experimental order value may not be used in the extrapolation, since considerable data exist from the sales records of the Zenith service implemented in the two to three years prior to the test.

(ii) The second assumption is that the ratio and volume would be constant for the future. Catalogue distribution policy is an integral part of any mail-order marketing strategy, and is subject to changes in view of the competitive environment. Because of the growing popularity of in-home shopping, it is expected that a larger percentage of major catalogues will be distributed, as well as an increase in the smaller ones.

The implications for the Zenith are considered to a limited extent in the decision, subjectively modifying the number of calls. Should the decision be made not to implement, the continuing feedback from the CSOs on Zenith sales would provide information for the re-evaluation of the decision.

Calls/Catalogue/Year (r)

$$\text{The calculated ratio} = 52 \frac{r_A}{A(\text{FSQ})(P_A)} + \frac{r_B}{B(\text{FSQ})(P_B)}$$

where: r_A is the number of calls over the test period between the initiation of the service and the distribution of the WS books,
 A is the period above in weeks,
 FSQ is the number of Fall Sale books (FSQ),
 P_A is the fraction of business done over this period,
 r_B is analogous to r_A , for the test period between the distribution of the WS books and the end of the test,

B is the period above in weeks, and
 P_B is analogous to P_A .

The adjusted ratio

$$= 52 \frac{r_A}{A(FSQ)(P_A)} \cdot \frac{FSQ}{FSQ + NNQ_1} \cdot \frac{r_B}{B(FSQ)(P_B)} \frac{FSQ}{TWS}$$

where $(FSQ + NNQ_1)$ is the number of customers to whom the advertising was mailed. TWS is the total number of Winter Sale books distributed. Factors r_A and r_B are available from the Telephone Order Recap form (Exhibit 9). P_A and P_B are available from sales records.

The experimental value for r is supplemented by both the sales records for areas which have had Zenith service for some time and the r as calculated from data on the OZ region. This latter "r" is calculated using the same procedure as for the "r" from the NZ regions. It is expected that this last estimate of r will be the highest of the three. The impact on Zenith Sales of planned marketing strategies, such as increased distribution of catalogues, and plans on advertising Zenith, would be taken into consideration.

Portion of Calls Resulting in Orders (t)

This factor is the ratio of total catalogue orders (including "Specials") to total catalogue calls. As previously mentioned, this factor and the one following in the discussion, incorporate both managerial risk preferences and a procedure for considering interaction with the number of calls. The detailed procedure is discussed on pages 75 and 76.

Portion of Order Calls Resulting in a New Order (w)

$$w = \frac{\text{Additional sales}}{\text{Total telephone sales}}$$

where both numerator and denominator refer to catalogue (and "Specials") sales. The detailed procedure is on page 76.

Average Value for Telephone Order

As mentioned, the test order value may not be directly used in the model.⁵³ The reason is that Sales records for areas which previously had Zenith service (PZ) exist, and show that there is some variability by region. Thus, the records, by covering a larger number of exchanges over a period of several years (and including both Fall-Winter and Spring-Summer data) are more representative than the test data. The drawback is that the data are in the form of value per call, rather than value per order. An adjustment is made using the proportion (total catalogue calls-requests for catalogue). The denominator adjusts, in part, for the calls from people without a catalogue.⁵⁴ This order value thus computed is then compared with the test order value. This latter value would be used if it were lower than the order value computed using the Zenith Sales record data by more than 5 per cent. In effect, the model has resolved the dilemma (a more representative sample of value per call adjusted by the test proportion, to estimate order value versus the test order value) by producing a conservative estimate.

Factor for Reducing Gross Value to Net Value

The two factors which are considered are cancellations, both by

the Company and by the customer, and customer exchanges. The implicit assumption is made that the increased ease in ordering will not result in a higher exchange or cancellation rate. Intuitively, it would appear that this assumption is incorrect. The customer may be expected to deliberate more over an order placed by mail than one placed over the telephone. However, it should be noted that the vast majority of orders are for more than one type of good. Therefore, once the customer decides to order one item, the others in terms of exchanges, cancellations are considered in the same category as the telephone orders.

$$\text{The cancellation factor} = \frac{\text{filled orders}}{\text{filled and cancelled orders}}$$

$$\text{The exchange factor} = 1 - \text{exchange rate}$$

$$\text{Net sales} = \text{gross sales (excluding tax)} \times \text{cancellation factor} \\ \times \text{exchange factor}$$

The factor used is therefore cancellation factor x exchange factor

The costs of exchanges and cancellations are included in variable House and CSO costs.

Cost Factors

The following cost factors are used in the extrapolation formulae. The "S" and "D" following a factor indicates a separate calculation, and a more detailed discussion in the following chapter, respectively.

- (a) Cost of goods sold
- (b) Variable operating costs (including delivery costs)
- (c) Delivery costs (S)

- (d) The factor H (S) (D)
- (e) Variable long distance charges (S) (D)
- (f) Fixed telephone service/listing charges plus advertising and labor costs.

The first three costs are entered in the formulae as variable cost per order. The long distance charges are also used separately in the formulae.

Cost of Goods Sold

The information is available from the Merchandise Control Department. The differences in marking in the various merchandise categories are adjusted by weighting on the basis of the categories in which the additional sales are expected to be made (such as fashions and notions) and the distribution of such sales.

The cost of goods sold factor = 1 - marking - interest charges,
 where marking = $\frac{\text{selling price} - \text{cost}}{\text{selling price}}$; and the interest charges
 $= \frac{\text{annual rate of interest}}{\text{average turnover per year}} \times \frac{\text{cost}}{\text{price}}$

Variable Operating Costs (labor and materials)

Variable costs can be placed in one of three categories: directly variable; semi-variable (there is a fixed element); and step variable.

An example of the last category is:

if $y = a + bx$ $x = 1$ for volumes between 1-100
 $x = 2$ for volumes between 101-200
 and so on.

Each department which is affected by volume of orders would be considered. This study uses two measures of volume--numbers of orders,

and size of orders as measured by sales dollars. Certain departmental costs, such as those of the Accounts Office, are variable with orders; others, such as those of Order Filling departments, are variable with sales. Both labor (excluding supervision) and materials costs are taken as being directly variable with volume.⁵⁵ Once the costs are calculated, they would be expressed as a percentage of sales.

Delivery Costs

There are two types of delivery costs with which this study is concerned. One is postage, the other cost is the incremental charge incurred in sending goods to the CSO by Express. (Goods shipped to the CSO are grouped into cartons to reduce the handling charges.) The Express costs in sending goods such as refrigerators direct to the customer are not considered, since it is unlikely additional sales are for major expenditure goods.

The procedure in calculating the postage charge is by finding the average weight of a parcel, then applying the weight to the postal rates for the forthcoming year. The average weight can be found by analyzing the volume and costs data found in the records. There are three assumptions, each of which is believed to be realistic. The assumptions are: the weight of a parcel is independent of the province; weight variations from the previous year are negligible; and the distribution of parcels follows the distribution of sales with respect to provinces.

The information required for the calculation is:

- (a) Postal rates by province
- (b) Distribution of sales by province

(c) Annual number of parcels

(d) Total dollar cost of postage for the previous year.

The following calculation will demonstrate the procedure. The data given are based upon ease of calculation.

	Manitoba	Saskatchewan
Postal charge for the first pound (¢)	20	25
Each additional pound (¢)	5	6
% of business	50	50
Total postage prior year \$30,000		
Total number of parcels 100,000		
Average postage cost per parcel 30¢		

Then, $30¢ = .50 (20 + (x-1)5 + 25 + (x-1)6)$ where x is the weight of the parcel

Solving, $x = 2.36$ pounds.

This weight is then applied to the forthcoming year's rates, and to the weight for the CSO Express charges.

The Express charges can be roughly calculated per parcel by dividing the total Express costs by the total number of units delivered by express. Since such goods as refrigerators are delivered by Express, the data are not as accurate as those for the postal rates. However, since the average delivery costs for the test equal % DM (postal cost) + % CSO (Express cost), and since the % CSO is expected to be virtually negligible, the inaccuracy is not thought to be relevant.

Because of the method of calculating the percentage of new orders, the estimate of delivery costs is relatively high, leading to a

conservative estimate of additional profit. As stated, the fraction of new orders = $\frac{\text{additional sales}}{\text{total telephone sales}}$. Thus, it is apparent that it has been assumed that new business results from the customers' ordering more frequently without the consideration that some of the new business will result from her buying more per order (that is, impulse buying in addition to the initially planned order). Therefore, the fixed cost for the first pound has been included in all new orders, whereas only a portion of the fixed charge should, ideally, be included.

Cost of Variable Long Distance Charges

The first step in determining the average cost per call is to determine the average length of a call. This is done by taking the average cost for each of the Exchanges in the test and applying the exchanges cost structure. The procedure is shown in Exhibit 14. The second step is to take a sampling of Exchanges and calculate an average rate of charge which is weighted by the number of subscribers in each of the sample Exchanges. The procedure is shown in Exhibit 15. The average cost is therefore the average length applied to the average rate of charge.

Cost of Telephone Listing/Service Charges,

Advertising and Labor Costs

The telephone costs are provided by the telephone companies. Since there is Zenith service existing in some areas, the additional annual fixed cost is the difference between the annual charge for a "blanket" coverage and the existing annual charge. The advertising cost would be

an estimate of the planned expenditures should Zenith be implemented.

The labor costs are those for updating the records of Zenith sales.

The Factor H

This factor was discussed under the sub-heading "Transference in Method of Delivery." $H \times$ the difference in cost between a mailed order and one sent to the CSO is the additional cost incurred when a transferred sale is sent by direct mail rather than sent to the CSO.

Formulae

The risk involved in extending Zenith service is in the uncertainty in generating sufficient contribution from additional sales to cover the following additional costs.

1. Long distance charges for transferred business

$$= (c)(r)(t)(1-w) A$$

2. Long distance charges for inquiries = $(c)(r)(1-t) A$

Notation for the Factors

Symbol

(i) Revenue

C	Catalogues in potential NZ regions
r	Calls/catalogue/year
t	Portion of calls resulting in an order
w	Portion of order calls resulting in a new order
v	Order value
G	Factor for reducing gross sales to net sales

(ii) Cost

H	Factor for postal charges due to T/B from CSO to DM
D	DM delivery cost-CSO delivery cost
L	Telephone service/listing charges, advertising and labor costs

A Cost per long distance call
 E Variable cost per order (% of sales \$--it includes A)

(iii) Outcomes

bs Breakeven additional sales
 ps Expected additional sales
 vp Expected additional variable profit

$$3. \text{ Transfer in method of delivery} = (c)(r)(t)(1-w)(H)(D).$$

The required additional sales to cover these costs, in order to break even (bs) is:

$$= \frac{(c)(r)[A-t w(A+HD) - HD]}{1-E}$$

where the numerator is the sum of the above in a simplified form:

The extrapolated additional sales (ps) is:

$$= (c)(r)(t)(w)(v)(G)$$

$$\text{The risk coverage} = \frac{PS}{bs}$$

The variable profit (profit before fixed costs) (vp) is:

$$= (c)(r)[p's-b's](1-E) \text{ where } p's = \frac{ps}{cr}; b's = \frac{bs}{cr}$$

The total additional profit is:

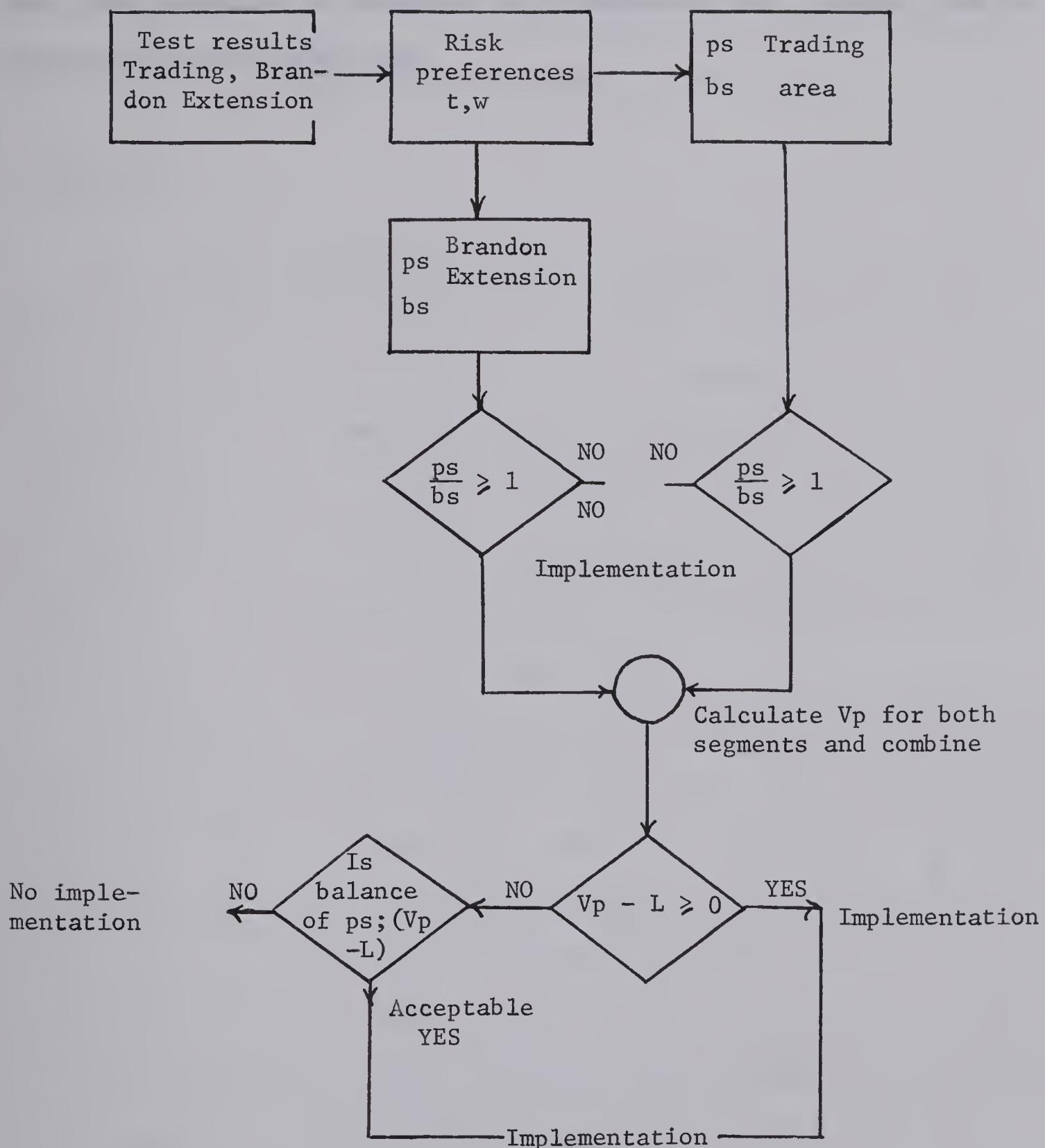
$$= vp - L$$

The following is a diagram of the decision rule.

Conclusion

This chapter has presented the methods of determining the values of the cost and revenue factors. While some of the factors have been dealt with in their entirety, the following chapter presents detailed

Diagram of the decision rule.



operating procedures for other factors. The extrapolation formulae have been presented to integrate the information into a usable form for input into the decision rule.

CHAPTER V

DETAILED FLOW OF INFORMATION

Introduction

This chapter discusses the detailed procedures for calculating and deciding upon values for several of the factors. These factors are: the calls/catalogue (r), the portion of calls resulting in an order (t), the portion of order calls resulting in a new order (w), the increased delivery charges due to changes in delivery from CSO to DM when sales are transferred from over the counter transactions to telephone transactions (H). The methods for determining the values of the other factors have been discussed in sufficient detail.

The presentation of the procedures begins with a description of the gathering and summarizing of the sales input data. The analysis of the information follows in three parts. The first part deals with the combining of the sales input data, which prepares the data for the second part -- the calculation of the transferred business and new sales by period, and of the factors r , t , and w by period. The final stage deals with the relationship between the factor t and the number of calls (hereafter referred to as u), and between the factors w and u ; and the methods of deciding upon the specific values for each of r , t , and w . The final procedures dealt with in this section are the calculations of H and A . A flow chart is presented in Appendix A.

Gathering and Summarizing Sales Input Data

There are two types of sales input data. The first is the total sales data, the other is the telephone sales data.

Total sales data

(a) Description of the system

The Catalogue Distribution Department (hereafter referred to as W167, which is the department number) receives different types of documents for updating customer records. Each document indicates the value of a particular order (including Provincial and Federal tax) and the name and address of the customer.⁵⁶ The documents, received daily Monday through Friday, are: address labels, shipping bills, display merchandise control slips, and city telephone control slips. Hereafter these documents are referred to as A/L, S/B, and M/C, respectively. The city telephone control slips are used for recording Winnipeg and Vancouver telephone orders only, and are therefore not included in the model.

The A/L are received in W167 on the day after the order is received in the House, with the exception of the C.O.D.-CSO A/L which are received after a C.O.D. control process. S/B are received in W167 after the order has been processed, since this document is integrated into the order filling and delivery procedure. The M/C, issued for sales of merchandise carried at the CSO, are received after processing through the display merchandise recording system. The date the order arrived in the House, in the case of the S/B and C.O.D.-CSO A/L or the date the

merchandise was sold, in the case of the M/C, is found either written or imprinted on the document.

(b) Recording the data

The documents for the specified post offices, after recording in W167, are received each week in the Industrial Engineering Department and recorded on the "Order Value Tally" form (Exhibit 2).⁵⁷ The documents are in alphabetical order, by post office, and are for orders received in the House on a Friday through to the following Thursday basis in the case of the A/L (excepting the C.O.D.-CSO A/L), which constitutes the majority of documents. Consequently, in order to correlate on the basis of the week in which the order was received in the House, the dates on the other documents (C.O.D.-CSO A/L, S/B, and M/C), are used to record the data in the appropriate week. Further, because of the time lag, the data for any particular week are not considered complete for a designated period of about two weeks. This period is subject to revision, depending on the actual time lags experienced. Once the waiting period is over, the following adjustments are made before recording the data on the "Order Value Summary" form (Exhibit 5).

Cancellation adjustment

As noted in the footnote on page 66 (number 56), the C.O.D.-CSO A/L does not record the value of the initial order, but rather the value of the goods shipped. Consequently, an adjustment is made, using cancellation data available from records, for the week in which the order reached the House. The cancellation form is shown in Exhibit 3. The adjusted data are recorded on the "Order Value Tally" form. No

adjustment is made for refunds, since this source of error is not expected to be significant.

Tax adjustment

Because Provincial and Federal tax is included in sales, an adjustment is made to reduce sales to a before-tax gross sales basis. Information from management records is entered on the "Tax Adjustment" form (Exhibit 4), and transferred to the "Order Value Tally" form, on a weekly basis.

The data from the "Order Value Tally" form are transferred to the "Order Value Summary" form. As shown in Exhibit 5, this form gives the gross sales by DM and CSO and by FC, NZ, and OZ by week. There is one such form for each of the trading areas and one for the Brandon-extension. These summarized data are then entered into the "Data Analysis" form which combines the total sales data and the telephone sales data. Before discussing this combining procedure, the discussion will turn to the telephone sales data.

Telephone sales data

Telephone sales data (gross sales, excluding tax) and other information on the nature of the customer's call, is recorded on the "Zenith Test Survey" form (Exhibit 6, and hereafter referred to as the ZTS form), by the clerk's taking the call at the CSO, following the instructions (Exhibit 16). These forms are sent to Winnipeg at the end of each week. In order to have the telephone data cover the same period of time (Friday-Thursday) as the total sales data, the ZTS forms are placed into Thursday to Wednesday groupings, since it takes one day for an

order placed at a CSO to arrive in the House. The information is then recorded on the Temporary Telephone Order Recap Form (Exhibit 8). This form in effect holds the information prior to confirmation, using telephone cost data (Exhibit 7) from MTS and SGT, that the data are complete. This confirmation is made by comparing the calls recorded by the telephone companies and the calls recorded at the CSO. A multiplication factor is then calculated, which is the E calls (SGT, MTS) $\div \Sigma$ calls recorded. The factor is then applied to all the data. Once these adjustments have been made, the data are recorded on the telephone order recap form.

This adjustment would be accompanied by communication with the District Sales Supervisor and the CSO Supervisor, should there be a serious discrepancy between the two recorded totals.

Analysis of Sales Input Information

Combining total sales and telephone sales data

The combining of information for analysis requires two steps. The first step is the subtraction of telephone sales from total sales to arrive at "pure" data. This information is recorded on the "Data Analysis" form (Exhibit 10). The second step is combining the "pure" data for the four FC areas and for the five trading areas. This is recorded on the "Data Analysis Summary" form (Exhibit 11). At this stage, the information is ready for the calculation of transferred business.

Calculation of transferred business

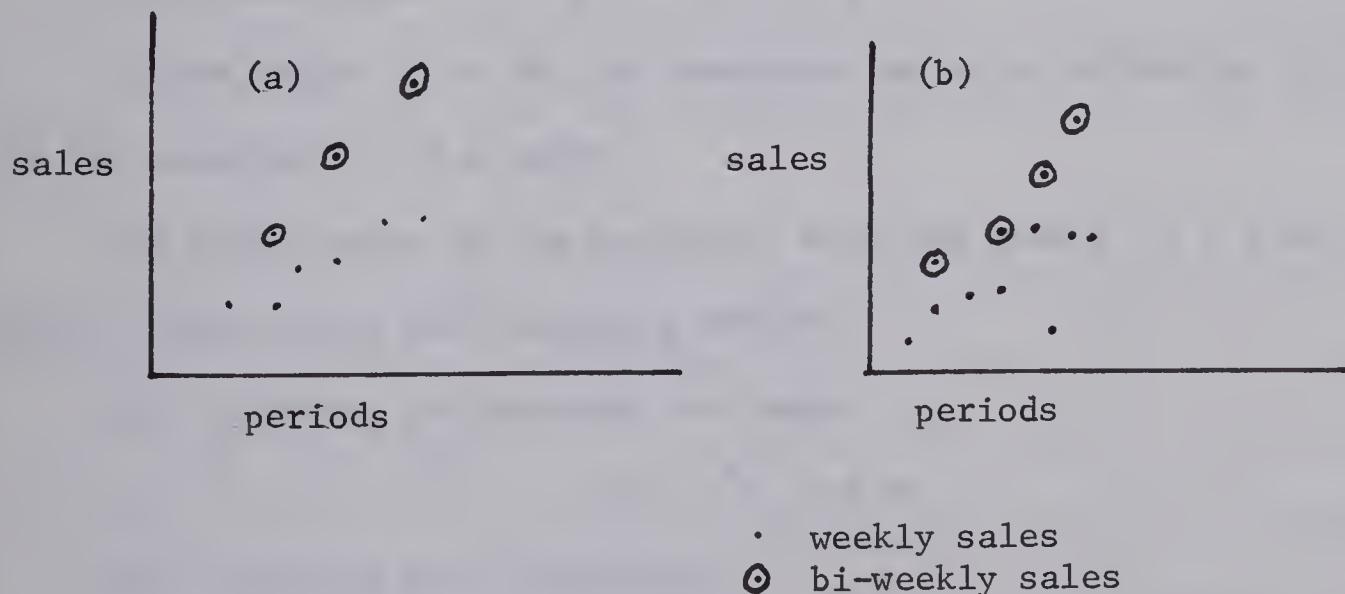
As was noted in the section on the conceptual basis of the experiment, transferred business can be expressed in equation form as the

difference between the equation of the trend line on the NZ area, and the trend line of the FC area which has been adjusted for the intercept of this NZ equation. There are ten separate T/B formulae. The data are found in the "Data Analysis Summary" form.

(a) Calculation of the trend lines

The following procedure applies to each of the eighteen trends: five new Zenith areas (by DM and DM+CSO); and four fire call areas (by DM and DM+CSO).

1. The information is graphed, by week, for the decision as to whether the data are better grouped in two-week periods, or left in weekly form. One criterion for decision is data with a distribution such as that illustrated in (a) below, which can indicate the possibility of interference due to such factors as pay period. Another basis is the existence of irregular curves, as in (b) below, which, when grouped, give regular curves.



2. Whether the trend is linear or curvilinear is visually determined to provide a starting point for the calculation. It is expected

that there will be two distinct curves, one ending with the end of the Christmas purchasing period; and the other beginning at this point and continuing to the end of the test period (February 15).

3. If the trend is linear, then the regression line is

$y' = \bar{y} + b(\bar{x} - x)$ which rewritten is $y' = (\bar{y} - b\bar{x}) + bx$, where:

x = period (the analysis begins for $x=1$ for each distinct curve)

n = the number of periods

y = sales during the period

$$a = (\bar{y} - b\bar{x}) \quad b = \frac{\sum xy - n \bar{x} \bar{y}}{\sum x^2 - n \bar{x}^2}$$

The relationship is then tested for completeness of explanation for the variation, by finding the ratio of explained variation to total variation.

$$\text{Explained variation} = y'^2 = a\sum y + b\sum xy - \bar{y} \sum y$$

$$\text{Total variation} = y^2 = \bar{y}^2 - y \sum y$$

If the ratio is $> .90$, the analysis can stop, otherwise it continues to the calculation of a curve.

The first curve is the parabola, with the form $y' = a + bx + cx^2$ and is found using the following method:

The following calculations are made:

$x, x^2, x^3, x^4, y, xy, x^2y$, and n .

The equations are constructed:

$$\sum a + \sum b x + \sum c x^2 = \sum y$$

$$\sum a x + \sum b x^2 + \sum c x^3 = \sum xy$$

$$\sum a x^2 + \sum b x^3 + \sum c x^4 = \sum x^2 y$$

The next step is solving for a, b, and c. In calculating the explained to total variation ratio,

$$\text{Explained variation is } \Sigma y^2' = a\Sigma y + b\Sigma xy + c\Sigma x^2 y - \bar{y}$$

$$\text{Total variation is } \Sigma y^2 = \Sigma y^2 - \bar{y}\Sigma y.$$

If the ratio is not high enough, the next higher polynomial would be derived. This equation has the form $y' = a + bx + cx^2 + dx^3$. The same format as above would be used. Further inputs would be Σx^5 and $\Sigma x^3 y$. The testing for completeness of explanation of variation would also take the same format.

It is possible that the relationship is too irregular, and that these simple equations do not explain enough of the total variation. In such an event, there are three alternatives which could be used. One alternative is that of grouping the data into bi-weekly or some other combination of weeks. Another alternative is to subdivide the curve into a number of sections (in addition to the 2 sections mentioned on page 71). The third alternative is to apply such mathematical functions as square roots. It is anticipated, however, that the simple equations would be sufficient.

Before any calculation of transferred business can be undertaken, the following relationship must hold (with one exception) for the two curves under consideration.⁵⁸ The condition is that the intercept "a" for both curves must be the minimum (where the curve has a positive slope) or the maximum (where the curve has a negative slope) point on the respective curves. An example of a curve for which this is not true is $y = 10 - 2x + x^2$. In such instances, both curves must be

recalculated pairing y_{i+1} and x_i (thereby deleting $y_{x=1}$ from this particular equation). This procedure would be followed until the relationship did hold. It is possible that iteration of the steps would not fulfill the condition. In such an event, the curve could be either separated into a set of curves and/or lines. The reader will notice that this is the case with the testing of the model, that, in part, the curve was divided into two lines. The Y values thus deleted would be subject to separate analysis, that is, considered as a separate distinct curve. Where a Y must be dropped and no separate curve can be formed, as, for example, if the first Y only, were deleted, the corresponding telephone sales would be eliminated from the analysis.

A separate calculation for T/B is made for every set of distinct curves within the trends which are compared.⁵⁹ The first step is to adjust the (DM + CSO) curve of the FC to that of the (DM + CSO) curve of the NZ areas, using the ratio of the Y intercepts. Thus, for example, if $y_{FC} = a + bx + cx^2$ and if $y_{NZ} = a' + b'x + c'x^2$ then y_{FC} adjusted = $\frac{a'}{a} (a + bx + cx^2)$; and the T/B is $\frac{a'}{a} bx - b'x + \frac{a'}{a} cx^2 - c'x^2$.

To calculate the D/M-T/B, the DM curve for the FC area is adjusted by the ratio $\frac{a'}{a}$, and the subtraction made. The formulae are then summarized, for reference, on the "Transferred Business Formulae" form (Exhibit 12).

Calculation of new sales

The form used in this analysis is the "New Sales" form (Exhibit 13). The telephone sales for the combined areas are summed and entered. The sales for the Brandon-extension are analyzed separately using the same

form and procedure. By entering the x value for the period, the T/B is found by period for each region. The T/B for the four trading areas are added and entered onto the "New Sales" form. The difference between telephone sales and T/B is the amount of new sales for that period. The factor w is new sales divided by telephone sales.

Relationship between the number of calls and t,
and between the number of calls and w

There is a possibility that there is a correlation between the number of calls (hereafter abbreviated to u) and t, and between u and w. This relationship has been suggested in the section entitled "Internal Validity -- Statistical Regression." The first step in finding the correlation is the recording of t, w, and u on the "New Sales" form. The calculation of w has been discussed. The factor t is calculated from the data on the "Telephone Order Recap" form. It is the number of catalogue orders (CO on the form) divided by the number of calls (C on the form). The set of values for both t and w in the correlation includes the data from the "Old Zenith" regions, and the data from the Brandon-extension. These last two sets of data are included since it is expected that, while the number of calls per catalogue may vary among the three regions (combined trading, Brandon-extension, and Old Zenith regions), the relationships discussed are independent of region.

The correlation coefficient is calculated from the formula

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

where the independent variable x is u, the dependent v variable y is t for the first relationship; and is w for the second relationship. The variable n is the number of pairs of data.

The hypothesis H_0 , which is being tested, is that correlation is zero, with a confidence level of 80 per cent.⁶⁰ The critical values are

$$\frac{-a}{n-1}; \frac{a}{n-1}$$

where a is the Z value corresponding to the level of confidence.

Calculation of r

It has been previously suggested that the experimental value of r, as calculated using the NZ areas only, is supplemented by further data. The method of calculating r was discussed on page 53. In order to estimate a long-run value for r, the experimental values are combined with the r found for the OZ regions and the estimates for areas which previously had Zenith service but not included in the test. Also included would be the estimated effect of planned changes in marketing strategy. Such estimates would be almost entirely subjective in nature. Therefore, the impact of such estimates would be limited.

Calculation of t

If the correlation hypothesis is accepted, then t is assumed to be independent of the number of calls. In this case, the probability distribution of t, from the NZ test regions, is used to arrive at an acceptable value. Management would express an acceptable level of probability which is used to calculate the acceptable proportion T. T is given by the formula

$$T = t + a \frac{t(t-1)}{n-1} \quad \text{or} \quad t - a \frac{t(t-1)}{n-1}$$

where a is the Z value corresponding to the acceptable level of probability.

If the correlation hypothesis is rejected, then a regression curve is calculated relating t and the number of calls (m) by week ($t = f(m)$), using the same set of formulae used in calculating the trend lines.

The standard error of estimate Se is found from the formula

$$Se = \sqrt{\frac{\sum_{i=1}^n (y_i - y'_i)^2}{n - 2}}$$

where y_i is the actual observed value, and y'_i is the corresponding predicted value. Since R , the response, has been decided upon, and since the number of calls per week, m , = $\frac{C \text{ (the number of catalogues)} \times r}{52}$, M is found by substituting R into the formula. T is found by substituting M into the function $t = f(m)$. The acceptable value for T is $t + aSe$ or $t - aSe$ where a is the Z value corresponding to the acceptable level of probability.

Calculation of w

The calculations for w follow the same pattern as the calculation of t .

Calculation of H

The formula for H is
$$H = \frac{T(\frac{M}{N}) - P}{T}$$

as derived in the section entitled "Transference in Method of Delivery," pages 37 and 38.

where: T is the total transferred business T/B (DM + CSO) as found on the "New Sales" form;

M is the amount of telephone sales which have been sent DM. This is DMV on the "Telephone Order Recap" form, summed for the trading areas. A separate calculation is made for the Brandon-extension.

N is the amount of the total telephone sales, from the "New Sales" form; and

P is the actual T/B DM from the "New Sales" form.

Conclusion

This chapter has presented the detailed procedure for calculating some of the factors necessary in the extrapolation. Combined with the methods of determining the values of the other factors, discussed in the previous chapter, these detailed procedures render the model operational. The next step is the testing of the model, which is the concern of the following chapter.

CHAPTER VI

TESTING THE MODEL

Introduction

It would have been desirable to use the actual data generated, and the information from the records, to determine the profitability of the service. However, the data was not released to the writer, for reasons of competition. The writer did, however, discuss the results with Mr. C. K. Bouskill, the Industrial Engineering Manager. The original design was applied with one minor procedural modification which did not concern the internal consistency of the model. Because the model is believed to be internally logical and operational, some of the steps have been omitted. For example, rather than compiling a set of tables to calculate the average cost of a call, the writer has placed realistic limits on the duration and referred to a random number table. It is felt that such circumventions do not detract from the testing of the model.

The Number of Catalogues in the Extrapolation

The total number of catalogues distributed by Eaton's in 1968 was approximately 22 million.⁶¹ The population in Manitoba and Saskatchewan, in 1966, was estimated at 1,912,000 out of a total of 19,919,000 for Canada as a whole.⁶² Assuming the same proportion for 1969 and an

even distribution of catalogues throughout the nation, the total number of catalogues in the two provinces is estimated at 2,118,000. Assuming that of this total 10 per cent represent the Fall Sale catalogue distribution, the number of Fall Sale books distributed is 211,800. Of this total, let 20 per cent be distributed to the potential New Zenith areas. The resulting total of 42,360 is divided to give the number of catalogues in each market segment. The number of catalogues thus distributed is 29,652 for the ETA, and 12,708 for the NETA.⁶³

Proportion of Order Calls Resulting in a New Order (w)

The following data are used to demonstrate the procedure.⁶⁴ These represent the (DM + CSO) sales for the FC and NZ areas (Brandon-extension).

Period	FC Sales (\$)	NZ Sales (\$)
1	6070	1620
2	6400	1670
3	6870	1730
4	7310	1810
5	7770	1900
6	8380	2080
7	9550	2200
8	11120	2420
9	13290	2670
10	4900	1461
11	4976	1475
12	5245	1533
13	5277	1587

1. The first set of data, for periods 1 through 9, were thought to be curvilinear. The equations calculated were:

$$\text{NZ: } Y = 1634 - 14.93x + 14.26x^2$$

$$\text{FC: } Y = 6613 - 379.3x + 120.38x^2$$

Since $Y_{x=0} > Y_{x=1}$ for the FC area by a relatively large amount, the first pair of data ($x=1$, $Y_{FC}=6070$, $Y_{NZ}=1620$) were eliminated and the equations recalculated. The FC set produced the relationship

$$FC: Y = 6908.5 - 39718x + 145.8x^2$$

Again noting that $Y_{x=0} > Y_{x=1}$, the curve for the FC was recalculated, using 7 pairs of values. This resulted in the equation:

$$FC: Y = 7279 - 435.55x + 182.39x^2$$

After this calculation (noting that $Y_{x=0} > Y_{x=1}$) it was decided to split the 9 pair into 2 subsets. The first subset contained the data for periods 1 to 6, the second 7 to 9. The results are given below.

First set of data	FC	E/T^{65}	NZ
First line (periods 1 to 6)	$Y = 5523.3 + 460x$.993	$Y = 1494.8 + 87.7x$
			E/T
			.946
Second line (periods 7 to 9)	$Y = 7580 + 1870x$.991	$Y = 1960 + 235x$
			E/T
			.999
Second set of data	FC	E/T	NZ
	$Y = 4694.5 + 195x - 11x^2$.946	$Y = 1474.5 - 19.9x + 8.5x^2$
			E/T
			.965 ⁶⁶

The T/B is calculated by first calculating the T/B equations, then solving using the x values.

The T/B equations for the first set are:

$$T/B = 36.8x \text{ (for periods 1-6), and}$$

$$T/B = 248.5x \text{ (for periods 7-9).}$$

The T/B in (\$) is 772.80 and 1491.00, respectively, for a total of 2263.80.

The T/B equation for the second set is:

$$T/B = 81.15x - 11.96x^2.$$

The T/B in (\$) is 452.70. The total T/B in (\$) is 2716.50.

To calculate the proportion of new sales, the total telephone sales must be found. The rule was stipulated that the number selected from a random number table be between 2716.50 and 10,000.00. The number selected was 4948.75 (Row 00, Columns 1 and 2).⁶⁷ The proportion of order calls resulting in a new order is then $(4948.75 - 2716.50) \div 4948.75 = .451$.

The preceding has, as mentioned, represented calculation for the Brandon-extension. Using the above result the construction of the new order proportion uses a random number selection with the stipulation that such a number be between ± 10 per cent of the result. The number selected is .470 (Row 00, Column 6).⁶⁸

Proportion of Calls Resulting in an Order (t)

The proportion of calls resulting in an order can be reasonably estimated between .50 and .75. The random number selected is .51 (Row 00, Column 7) for the Brandon-extension.⁶⁹ Given the constraints that the corresponding proportion is within ± 10 per cent of .51, the selection for the trading areas is .54 (Row 00, Column 10).⁷⁰

It is assumed that there is no correlation between the number of calls, and the proportions (t) or (w).

Calculation of the Calls/Catalogue (FS)/Year (r)

For the purpose of testing the model, the assumption is made that a 10 per cent sample has been taken. That is, the Brandon-extension contained $.10 (12,708 \div .9) = 1412$ customers. Of this number, 400 calls were made.⁷¹ Assuming a 60:40 distribution of sales between the Fall-Winter and Spring-Summer, the annual number of calls would be $400 \div 6 = 666$. The test (r) is then $666 \div 1412 = .47$. The response from OZ areas would be expected to be somewhat higher. A reasonable estimate is 20 per cent higher. This would give a figure of .57. For the purpose of the test, it is assumed that management decides that the test value of .47 is reasonable for trading areas in which there is no CSO, and that it accepts the .57 as representative of CSO trading areas.

Average Value Per Order

The average value per order for the model is \$24.28. The estimated average sale, per item, in 1965 for Department Stores with sales over \$50 million is \$6.39.⁷² Since catalogue orders are generally multi-item, it seems reasonable to assume an average of 2 to 4 items per order. The figure, from a random number table is 3.8 (Row 01, Columns 4 and 5).⁷³ The average order value is then $3.8 (\$6.39) = \24.28 .

Factor for Reducing Gross Demand to Net Sales

The factor is taken as .085.⁷⁴ It is the percentage of returns to gross sales.

Calculation of H

There is an additional cost attached to the transferred business, in addition to the long distance charges. This is the increased delivery cost of orders which ordinarily would be sent to the CSO, but which are mailed as a result of the customer's phoning the order.

The factor H is multiplied by the difference in costs and another factor to arrive at this additional cost.

$$H = \frac{T\left(\frac{M}{N}\right) - P}{T}$$

where

N = telephone sales

M = telephone sales sent out DM

P = T/B DM

T = total T/B

For the model:

Trading areas:

Assume M:N ratio is .95

N = \$19,795

T = \$10,491.35 (432 orders)

P = 70% x 10,491.35

H = .25

Brandon-extension:

$$\begin{aligned}
 &\text{Assume M:N ratio is 1.0} \\
 &N = \$4948.75 \text{ (204 orders)} \\
 &T = \$2716.50 \\
 &P = 80\% \times \$2716.50 \\
 &H = .20^{75}
 \end{aligned}$$

Delivery Costs

It is felt that a reasonable estimate of the weight of an order would be between 1 and 3 pounds. The weight, as selected from a random number table, is 2.9 pounds (Row 01, Column 1).⁷⁶ The cost of mailing such a parcel is 48.5¢.⁷⁷ At an estimated 5¢ per pound, the cost of sending a parcel of the weight is 14.5¢. The estimate of 5¢ is derived as follows. From the postal rates, the charge for a 100-pound item is \$4.15. The weight of a carton being sent to a CSO is estimated at 80 pounds, the average cost per pound being 5¢. The delivery cost for the ETA is .95 (48.5¢) + .05 (14.5¢) = 46.8¢; for the NETA it is 1.0 (48.5¢) = 48.5¢. As a percentage of sales, assuming the \$24.28 per order, the costs are 1.92 per cent and 1.99 per cent, respectively.

Cost Per Long Distance Call

The average call is estimated as lasting between 3 and 4 minutes. Given these limits, the random number selected was 3.1 minutes (Row 01, Column 3).⁷⁸ The cost per call for ETA areas is estimated as 30¢ per 3-minute call and 5¢ for each additional minute; for the NETA areas, 40¢ and 10¢, respectively. The costs are for the ETA, 30.5¢; for the

NETA, 41¢. Expressed as a percentage of sales, these costs are 1.25 per cent and 1.69 per cent, respectively.

Variable Cost Per Order

Cost of goods sold

Marking	40.6%	⁷⁹
Annual interest	10%	
Average turnover	3.6	⁸⁰

$$\text{Factor is: } 1 - .406 - \frac{.10}{3.6} (1 - .406) = .578$$

Labor and Materials

The cost of labor and materials is taken as 8.57 per cent of sales.⁸¹

Subtotal of cost of goods sold, and labor and materials, is 66.37 per cent of sales. This figure is applicable for both the ETA and NETA market segments.

The total variable cost per order, as a percentage of sales in the subtotal above plus delivery costs and long distance charges. Below is summarized the total variable cost.

	ETA	NETA
Cost of goods sold and labor and materials	66.37% (of sales)	66.37%
Delivery	1.92%	1.99%
Long Distance Charges	<u>1.25%</u>	<u>1.67%</u>
	69.54	70.05

Fixed Costs

The estimated annual fixed cost is \$3100. This figure is composed

of \$1200 for advertising, \$500 for clerical costs for statistical work (3 days per month), and \$1400 for the additional telephone service/listing charges. This last figure is based upon the \$900 annual charge for "blanket" coverage charged by Alberta Government telephones. The additional charges would be slightly less, since portions of each province already were receiving Zenith service.

SUMMARY OF DATA

Revenue factors	Trading Areas	Brandon-extension
No. of catalogues	29652	12708
Calls/cat/yr	.57	.49
Portion of calls resulting in orders	.54	.51
Portion of new order calls	.470	.451
Order value	\$24.28	\$24.28
Factor for reducing gross sales to net sales	.915	.915
Cost factors		
Factor for incurring additional delivery costs due to trans- ference in method of delivery of T/B (H)	.25	.20
Direct mail cost--CSO cost (of delivery)	\$.34	\$.34
Fixed costs	Total of \$3100	
Cost per long distance call	\$.305	\$.41
Variable cost per order per- centage of sales	69.54	70.05

Application to Extrapolation Formulae

Additional data required for input into the decision rule

The number of orders for ETA is 432; for NETA, 204. The method of

finding these values is by dividing telephone sales by the average value per order. The number of calls for ETA is 800; for NETA is 400.

Introduction of management risk preferences

It is assumed that management will accept a figure for the proportion of calls resulting in orders, and for the proportion of order calls resulting in new orders such that p_b ($p \leq p_{test}$) $\leq .20$.

$$p = p_{test} - Z \sqrt{p_{test} \frac{(1 - p_{test})}{n}}$$

Calculation of t

$$\text{ETA } t = .54 \quad n = 800 \quad Z = 1.28 \quad t = .517$$

$$\text{NETA } t = .51 \quad n = 400 \quad Z = 1.28 \quad t = .478$$

Calculation of w

$$\text{ETA } w = .470 \quad n = 432 \quad Z = 1.28 \quad w = .449$$

$$\text{NETA } w = .451 \quad n = 204 \quad Z = 1.28 \quad w = .406$$

Data input into formulae

Trading area

$$\frac{ps}{bs} = \frac{twVG(1-E)}{A - t(w(A + HD) - HD)}$$

$$\frac{ps}{bs} = \frac{(.517)(.449)(\$24.28)(.915)(1 - .6954)}{.305 - .417(.449 \cdot .449[\$.305 + .25(\$.34)] - .25(\$.34))}$$

$$\frac{ps}{bs} = \frac{1.57}{.258} = 6.0$$

$$vp = Cr[p's - b's][1-E] \text{ where } p's = \frac{ps}{cr} \text{ and } b's = \frac{bs}{cr}$$

$$\begin{aligned} vp &= 29652(.57)(\$1.57 - \$258)(.3046) \\ &= \$6754.49 \end{aligned}$$

Non-trading area

$$\frac{ps}{bs} = \frac{t w v G (1-E)}{A-t(w(A+HD)-HD)}$$

$$\frac{ps}{bs} = \frac{.478(.406)(\$24.28)(.915)(1-.7005)}{\$.41 - .478 .406[\$.41 + .20 (.34)] - .20 (.34)}$$

$$\frac{ps}{bs} = \frac{1.291}{.376} = 3.4$$

$$vp = Cr[p's - b's][1-E]$$

$$vp = 12708(.47)(\$1.291 - \$.376)(.2995) \\ = \$1636.79$$

SUMMARY OF RESULTS

	ETA	NETA
The risk coverage	6.0	3.4
(additional extrapolated sales to additional breakeven sales required)		
Extrapolated additional profit (excluding fixed costs)	\\$6754	\\$1637
Extrapolated total additional profit	\\$5291	

The decision is therefore to implement the service.

Conclusion

This chapter is concerned with testing the model. Because the actual data were withheld, the writer constructed data from a variety of sources. Because it was believed that the model is internally consistent and operationalized, several of the minor steps in the procedure were omitted. The outcome was a projected additional profit of

\$5291. The decision, according to the rule, is therefore to implement a blanket coverage of Zenith service in Manitoba and Saskatchewan.

CHAPTER VII

SUMMARY

The purpose of this thesis was to construct a model, which would test and evaluate customer reaction to the Zenith service, and which would provide a decision about implementing the service throughout Manitoba and Saskatchewan.

Findings

Rather than attempting to place the model into one of the designs presented by Campbell and Stanley, the writer has analyzed the model in terms of internal validity and external validity. This analysis was the primary concern of Chapter III.

Chapter III opened with the postulation of three criteria of effectiveness, and the construction of a two step decision rule. This decision rule stipulated that the Zenith service would be implemented if one of the following conditions were met:

- (i) The projected additional profit ≥ 0 ;
- (ii) The projected additional profit < 0 ; the variable costs are covered; and the combination of additional sales and improved customer relations warrants the loss. This decision rule is thought to be realistic, and since management's risk preferences are incorporated into the model, the output is characterized by acceptable risk.

Two questions are posed by internal and external validity. First, did the experiment establish and measure a cause-effect relationship between the service and the criteria of effectiveness? Second, can the results be generalized from the five test regions to the level of the overall Provinces? These questions will now be answered in reverse order.

The Fall sale book was used as the basis of extrapolation. While the Fall and Winter book would increase external validity by reducing the possibility of the effects of a temporary competitive advantage, its use would have reduced internal validity. The trade-off favored the Fall sale book. Two sets of advertising were distributed, which while not completely simulating an actual marketing situation, is thought to be adequate within the cost limitations. The number of test regions was limited, and were not randomly selected. However, one critical factor, the risk coverage, is independent of response, and the other two factors are expected to be independent of region.

In controlling for internal validity, a control was used to measure additional business; adjustments were introduced to measure and account for customer responses outside the desired test set; the transfer of business in time was accounted for by gathering data over a period of six months covering the busiest portion of the year; an adjustment is made for customers' becoming used to the service and thereby changing the response pattern; and the recording of data was standardized. The conclusion is that while the experiment does have some limitations, the context in which the model was constructed necessarily reduced the

validity of the design. It is thought, however, that the model is valid for its purpose -- it does in fact reduce the uncertainty faced by the decision-makers.

The model was tested using fictitious data, since the actual information was withheld for competitive reasons. The result was an anticipated annual profit of \$5291. Based upon the decision rule chosen, the service would be implemented on a "blanket" scale.

There are, of course, many areas in which the model could be improved. The following discusses some of the other limitations of the study.

Analysis of the Model

Future changes in economic situation

Since buying power is a function of the economic situation, the decision based on the results of the study may be incorrect for future years. No attempt was made to relate the experimental data to the general economy of the regions, and thereby attempt to forecast possible effects from changes in economic conditions. Therefore, the model has validity only when the general level of disposable income remains fairly constant.

The major assumption

The major assumption, that the competitive and economic environments of the control and the test regions change at the same rate, was not tested. While it is felt that the reasoning behind the assumption is logical, an empirical test would have increased confidence as to its validity. This test could have taken two forms. First, data for the

test regions could have collected for a period of several months prior to the introduction of Zenith. The problem here is the question of cost, and time. Second, data for other regions could have been collected concurrent with the test. This, however, was not done. A post-test verification of the assumption would have the constraints of cost and time. One method which initially would appear promising is that of using the customer purchase records. However, sales are recorded by dollar increments, to a point, after which the increments are in terms of multiple dollars. For example, one category is \$50 to \$100. Therefore, the probability of an error in assessing the assumption would be relatively high.

There is some empirical evidence which suggests that the assumption is tenable. The test in Toronto indicated there was no case (of the seven catalogue sales offices) in which the transferred business was negative. The test in Winnipeg showed that none of the four test CSOs had a negative value for the T/B, nor a negative figure for the additional sales. Any wide divergence from the assumption would probably have yielded either, or both, of the negative data above for one or more of the test areas. This, of course, does not prove the method valid, but there is also no evidence that it is not a reasonable control device.

Store orders

While orders for store goods and inquiries pertaining to some aspect of store operations were recorded, they were omitted from the analysis. It is assumed that if the service proved profitable for the

catalogue operation it would also be profitable for the store operation. A problem arises in the case of a marginal decision in which the store's profit could make the service profitable for the organization as a whole. There are two reasons for having omitted calls pertaining to the store. First, it was anticipated, from the results of the Toronto study, that the number of such calls would be virtually nil. Second, there is no way in which the relevant revenue factors could be measured.

Control of data

While precautions were taken to insure completeness and accuracy in recording, errors and omissions were expected (and, indeed, were made). An adjustment is made by extrapolating on the basis of existing data. The assumption of proportionality may be questioned. However, the volume of data to be adjusted is expected to be low, due to the control process available.

Consumers not classified as Eaton's customers

As mentioned in Chapter II, the impact of Zenith service upon consumers not classified as Eaton's customers was not measured. It is possible that the added convenience of ordering, combined with the wide selection of merchandise and free home delivery, could persuade such consumers to order through Eaton's. However, the measuring of this impact entails widening the knowledge of the existence of the service, and invalidates attempts to restrict the effect of the temporary competitive advantage.

It is possible to segment callers into Eaton's customers, Simpson-Sear's customers, and those who do not fall into either of the previous

categories by asking the caller. However, the work of the order-taker would be increased, thereby leading to increased errors and omissions. Also, there are possible dysfunctional consequences with respect to customer relations. One example is a request for a catalogue which cannot be fulfilled. It is believed that the additional information would not justify the additional problems which would be incurred.

Improvements

The study, while conducted in the context of a catalogue operation of a particular firm, can be generalized to a limited extent. It is believed that the basic methodology could be replicated in future studies, not only of Zenith service, but in terms of other variables. One example is that of delivery policy.

It is believed that the following steps would improve any such similar study.

1. The representativeness of the sample areas could be improved by a more systematic selection process. One possible means of selection would be to segment the areas by disposable income, then to select test areas within such segments. This selection could be either through a completely random process, or one in which control considerations are taken into account.

2. The simulation of the market could be improved with a larger expenditure on advertising and/or a longer time duration for the test. A post-test survey of customer awareness of the service could give an indication of how well the market was simulated. These improvements

could be fairly expensive, and the benefits would have to be weighed against the costs.

3. The basic assumption should be tested, preferably concurrent with the test of the service to reduce cost, with a test area within each trading region. The problem is that all the trading regions may not be sufficiently large to test for both the service and the assumption. The selection process would therefore be affected, with possibilities for detracting from the representativeness of the results. One alternative is to select the areas for the test of the service, then find a comparable area in terms of economic and competitive conditions to test the assumption.

4. The control over the data could be improved by greater contact with the people recording the data. Also, since the recording of information could be time-consuming, hence leading to errors and omissions during busy periods, the possibility of designating one individual to monitor the Zenith calls should be considered.

Concluding remarks

One decision faced by Eaton's catalogue management was whether or not the Zenith telephone service should be implemented on a "blanket" scale in Manitoba and Saskatchewan. This thesis has presented and analyzed a methodology for the market-testing of this service to reduce the uncertainties faced by the decision-makers. It has been argued that, despite its limitations, the model does provide a valid base for the decision, given the particular context in which it was built.

NOTES

CHAPTER I

¹ For this service (termed Zenith), Eaton's would pay fixed costs, in addition to the long distance charges.

² The writer had some exposure to the records systems in his capacity as a methods analyst.

³ A copy of the preliminary draft of this thesis was submitted to Mr. C. R. Bouskill, the Industrial Engineering Manager for the Western Division, for approval of its contents. On September 18, 1969, the writer discussed the draft with him. He affirmed that the model correctly represented the original design in its structural aspects, and that the additional information used was available.

⁴ The reader will notice that the measurement of the proportion of order calls which results in a new order is the most critical factor in the experiment. In an experimental design, the effects of a stimulus (in this case, Zenith service) would be determined by comparison between the test group(s) and a control. In this experiment, the test regions act as their own control. This is done by assuming that the trend of sales, in terms of percentage increase from period to period, would have been the same for both the test region and for the town in which the CSO is located, if the Zenith service had not been introduced. The difference between the actual trend and the "control" trend represents the effect of Zenith service.

⁵ For examples, see Frank Stanton, "What is Wrong with Test Marketing?" Journal of Marketing, XXXI (April, 1967), pp. 43-47; and Kenneth P. Uhl, "Field Experimentation: Some Problems, Pitfalls, and Perspective," in Science, Technology and Marketing, Raymond M. Haas (ed.) (Chicago: American Marketing Association, 1966), pp. 561-572.

CHAPTER II

⁶ Impulse buying has been broadly defined as "purchases made without very much advance planning," by William J. Stanton in Fundamentals of Marketing (2d ed.; New York: McGraw-Hill Book Company, 1967), p. 124. Based on an empirical study, Hawkins Stern has identified four different types of impulse buying and has presented nine factors which affect these unplanned purchases, in his article, "The Significance of Impulse Buying Today," in Marketing Research, Parker M. Holmes (2d ed.; Cincinnati: South-Western Publishing Company, 1966), pp. 278-282. Pure impulse buying, which occurs infrequently, is a whimsical (and emotional) breaking of the normal buying pattern. Reminder impulse buying refers

to prior decisions to purchase, of which the customer is reminded; and to decisions made on the basis of a reminder of a need to buy. Suggestion impulse buying occurs when a customer sees a product for the first time and visualizes a need for it, even though she has no previous intentions of buying dependent on other factors, such as price specials. In planned impulse buying, the customer has intentions of buying dependent on other factors, such as price specials.

⁷ The concept of increasing customer convenience in marketing strategy is evidenced in such tactics as night shopping.

⁸ The measurement of one of the revenue factors, the proportion of telephone sales which constitutes additional sales, while including reasons one and two, excludes part of reason three. The additional sales, which might be generated by persons who would become Eaton customers because of the convenience of telephone shopping, has not been measured.

⁹ E. B. Weiss, Management and the Marketing Revolution (New York: McGraw-Hill Book Company, 1964), pp. 3-9.

¹⁰ In this context, it is interesting to note that Eaton's have recently introduced a Christmas catalogue for store merchandise in many of the major Canadian cities.

¹¹ As the construction of the original model progressed, several changes in methodology were made.

¹² The decision to eliminate catalogues as a basis of projection was taken after the analyst left Eaton's employ.

¹³ It was thought that customers residing in trading areas in which Eaton's did not have a CSO might have a different response pattern. Consequently, it was felt necessary to measure response from one of these areas.

¹⁴ For an example of a trading area, see Figure 5, page 21.

¹⁵ Mr. Harrison previously had responsibility for Saskatchewan.

¹⁶ Trading centers were designated with respect to decisions with which the writer is not familiar. For the purpose of the model the Market Research study did provide the required information.

¹⁷ Two sets of advertising, using the same format, were printed. The first set was mailed, the second was bound into the Winter Sale catalogue.

¹⁸ A specific description of the relevant information processing systems is discussed in the latter portion of the model.

¹⁹ The analytic aspects refer to the manipulation of the data provided by the experimental structure. An example is the introduction of management risk preferences into the model.

CHAPTER III

²⁰ The purpose of the original model was to provide additional profit estimates on three levels: pessimistic, average, and optimistic. The degree of pessimism-optimism was to be determined by the Industrial Engineering Department.

²¹ In the development of the original model, the primary emphasis was on profit. Potential sales and customer relations appeared, to the writer, to be objectives, which could have become important in the case of a marginal decision based on profit alone. This impression is based upon both general experience in the Company and the report (issued by the Central Division) of the test in Ontario and Quebec.

²² In this respect, the model is far from unique in marketing research studies. For example, Mark R. Greene states: "Most marketing research is undertaken to narrow the range of uncertainty within which executive decisions must be made. Marketing research does not eliminate all risk, but in an uncertain environment it does significantly reduce the risk by reducing ignorance." Mark R. Greene, "Market Risk -- An Analytic Framework," Journal of Marketing, XXXII (April, 1968), p. 53.

²³ The term "attitude toward risk" refers to a general propensity to assume risks. For example, while one manager may want an 80 per cent assurance that a new product will succeed, another may want an 85 per cent level of assurance.

²⁴ Richard M. Cyert and James G. March, A Behavioral Theory of the Firm (Englewood Cliffs: Prentice-Hall, Inc., 1963), p. 81.

²⁵ Donald T. Campbell and Julian C. Stanley, "Experimental and Quasi-Experimental Designs for Research on Teaching," Handbook of Research on Teaching, N. L. Gage (ed.) (Chicago: Rand McNally, 1963), pp. 171-246.

²⁶ Seymour Banks, Experimentation in Marketing (New York: McGraw-Hill Book Company, 1965), pp. 25-50. This author has drawn upon the previously cited work of Campbell and Stanley.

²⁷ Discussed in section headed Simulation, page 28.

²⁸ The extrapolation is based on the actual number of Fall Sale books, rather than those who would have been qualified at the time the advertising was distributed, for operational reasons. The adjustment necessary is discussed on page 40.

29 The original design restricted the "insert" to those Winter Sale books distributed to the people receiving the mailed advertising. Subsequently, it was found that this operation was not carried out, for operational reasons. The adjustment necessary is discussed on page 42.

30 A further condition of simulation is that the customer is accustomed to the service. This aspect is dealt with under the heading "Internal Validity -- Maturation," on page 47.

31 In the original model, the test value was used to estimate the value of an order, modified by the pessimistic-optimistic estimate. The test value may be used if the estimated order value is higher than the test value by more than 5%.

32 In the original model, no distinction was made between these segments. The South-Western region was treated as part of the Brandon trading area. Where the writer refers to the South-Western region as such, he will use the term Brandon-Extension.

33 Banks, op. cit., p. 28.

34 This factor is discussed in terms of "maturation," page 47.

35 This consideration was extraneous to the decision itself, but could have provided data useful for other decisions.

36 The difference is due to bulk shipment of goods to the CSO; whereas direct mail goods are mailed individually.

37 The control for the NETA market segment is the Brandon FC area.

38 The abbreviation PZ represents all areas with Zenith service prior to the test. The abbreviation OZ refers to PZ areas which were used in the test.

39 The purchasing pattern is described as customers (as a % of total or in numbers) on the y axis, and dollar purchases on the x axis, as shown on page 44.

40 The extrapolation is $\frac{\text{total additional sales}}{\text{those receiving Fall Sale book test areas}}$

x No. of Fall Sale books distributed in non-Zenith regions in Manitoba and Saskatchewan. This extrapolation, and the adjustments in the discussion of the temporary competitive advantage, are conceptual rather than the actual formula to be used. However, the results are the same.

41 In the original model, this type of analysis was not undertaken. FSQ, without adjustment, was used as the basis of extrapolation.

⁴² It would have been possible, but impractical, to eliminate the changes in the test set. The interference could have been eliminated by keeping separate records on customers entering and leaving the files. This, however, would have entailed in the writer's opinion additional clerical work unjustified by the additional information.

⁴³ The alternative method of segmentation -- that of FSQ + NNQ₁ -- would require an extrapolation -- i.e., FSQ + NNQ₁/FSQ x FSQualified for all Manitoba and Saskatchewan since it would not have been feasible to calculate directly the total number of customers who would have qualified. The extrapolation assumes the potential customers over-all is proportionally equal to the potential in NZ areas, since NNQ₁ is a function of the total number of non-customers. The assumption is probably incorrect, due to the variability of catalogue coverage.

⁴⁴ Individual buying patterns refer to customer loyalty, that is, the propensity to buy from Eaton's as opposed to other retailers. Two measures are the frequency of purchase and the value of orders.

⁴⁵ It is noted that the set NNQ₁, in terms of the concept of overlapping customers, as discussed on page 28, is similar to the set of people receiving the Fall Sale book, but not receiving the Fall and Winter book. Therefore, the set NNQ₁, with the qualification of not having received the former catalogue, may contribute to the effects of a temporary competitive advantage. The variable sales/cost ratio, which is of central concern, is not affected.

⁴⁶ Banks, op. cit., p. 28.

⁴⁷ This relationship was not calculated in the original model. The test results were used without further adjustment.

⁴⁸ The writer recognizes the limitations of extrapolating outside the set of values used in determining a regression relationship. However, given the duration of the test and the difficulties of simulation, it is felt that an adjustment is preferable to using the test data alone.

⁴⁹ Banks, op. cit., p. 82.

⁵⁰ Ibid., pp. 28-29.

⁵¹ Ibid., p. 82.

CHAPTER IV

⁵² The four trading areas are combined in the analysis. The other market segment is the Brandon-Extension.

⁵³ The original model did use the test value.

54 While the telephone books had a Zenith listing, there was little promotion of the service in the PZ areas. Consequently, it is believed that the proportion of calls for a telephone would be higher for the test areas than for the PZ areas. The adjustment, therefore, understates the profit potential.

55 The labor costs are actually step-variable, and it would be expected that the additional sales would be absorbed without actually increasing staff. However, because these sales would be contributing to any growth of sales, they could make the marginal difference which forces the incremental change. Consequently, these sales are allocated the share of labor costs.

CHAPTER V

56 While all other documents record the total value of merchandise, A/L for C.O.D. orders delivered to the CSO (hereafter referred to as C.O.D.-CSO A/L) record the order value less cancellations and money refunds as adjustments in substitutions of lower priced goods. The correction for this is discussed in (b), Recording the data.

57 There is one such form for each of the four trading areas and for the Brandon-Extension.

58 The exception is that if the ratio of explained to total variation is felt to be insufficient for the curve (or line); and the next higher polynomial does sufficiently explain the total variation, and, at the same time, the deviation from the condition is not too large.

59 As previously noted, two distinct curves are expected. Thus, in the form which summarizes the trend equations (Exhibit 12 -- "Transferred Business Formulae"), the curves have been split into two groups, and a T/B calculated for each. A similar procedure would be followed for any other number of distinct curves.

60 The confidence level is set relatively low, since the possibility of making a type II error -- that of accepting a hypothesis which is not true -- can have important consequences. Thus, even at this 80% level, if the decision is marginal, the regression would be calculated.

CHAPTER VI

61 Dick Brown, "It Began with Timothy Eaton," The Canadian Magazine, February 1, 1969, p. 6.

62 Susan Walters (ed.), The Canadian Almanac & Directory for 1967 (Toronto: Copp Clark, 1967), p. 298.

⁶³ The percentages given are thought to be reasonable, but are subjective estimates, and are not related to the data of the original model. (The writer left Eaton's employ before the clerical work was started.)

⁶⁴ The set of data for periods 1 to 9 were taken from Michael James Dunn, "The Supermarket: An Evaluation of a Queuing Model" (unpublished M.B.A. dissertation, University of Alberta, 1967), p. 93. The data represent daily sales volumes in an unidentified supermarket. The writer has selected 18 such daily sales from the 48 daily sales, based on the assumption of an increasing rate of sales beginning in September, and culminating at the end of the second week in December. The second set of data, for periods 10 to 13, were taken from Dunn, ibid., p. 94. These data represent the number of customers per day. The writer selected from the 48 daily customer count, to simulate the anticipated trend after the Christmas sales period.

⁶⁵ E/T is the ratio of explained to total variation.

⁶⁶ The difference between $Y_{x=0}$ and $Y_{x=1,x=2}$ is slight. Further, the E/T ratio is .965, whereas the corresponding value for the straight line equation is .850. Given the trade-off, it was decided to employ the curve.

⁶⁷ Saul H. Hymans, Probability Theory (Englewood Cliffs: Prentice-Hall, Inc., 1967), p. 326. In selecting the random numbers, the writer started at Row 00, Column 1. The first set of digits which met the stipulations was used. A particular cell (Row i, column j) either used, or bypassed because the numbers were excluded, were not used for other selections.

⁶⁸ Ibid., p. 326.

⁶⁹ Ibid.

⁷⁰ Ibid.

⁷¹ Given telephone sales of \$4948.75, and an average value per order of \$24.28 (see page 82) and a (t) value of .51, the number of calls is 400.

⁷² Sam Flanel, Financial and Operating Results of Department and Specialty Stores in 1965 (New York: Controller's Congress, National Retail Merchants Association, 1966), p. 47.

⁷³ Hymans, op. cit., p. 326.

⁷⁴ Flanel, op. cit., p. 47.

⁷⁵ It would be expected that more business would be transferred from DM than from CSO counter sales. Further, the percentage would be expected to be higher for the non-trading areas, due to the relatively large distance to the CSO. Both the 70% and 80% reflect the writer's expectations.

⁷⁶ Hymans, op. cit., p. 326.

⁷⁷ Official Canada Post Office rates for Manitoba and Saskatchewan, effective October 1, 1967 (form number 43-73-048 (9-67)).

⁷⁸ Hymans, op. cit., p. 326.

⁷⁹ Flanel, op. cit., p. 47.

⁸⁰ Ibid., p. 47.

⁸¹ Ibid., p. 51. This cost is the total of payroll and supplies for direct selling, customer service, and wrapping expenses.

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Stanton, William J. Fundamentals of Marketing. 2nd ed. New York: McGraw-Hill Book Company, 1967.

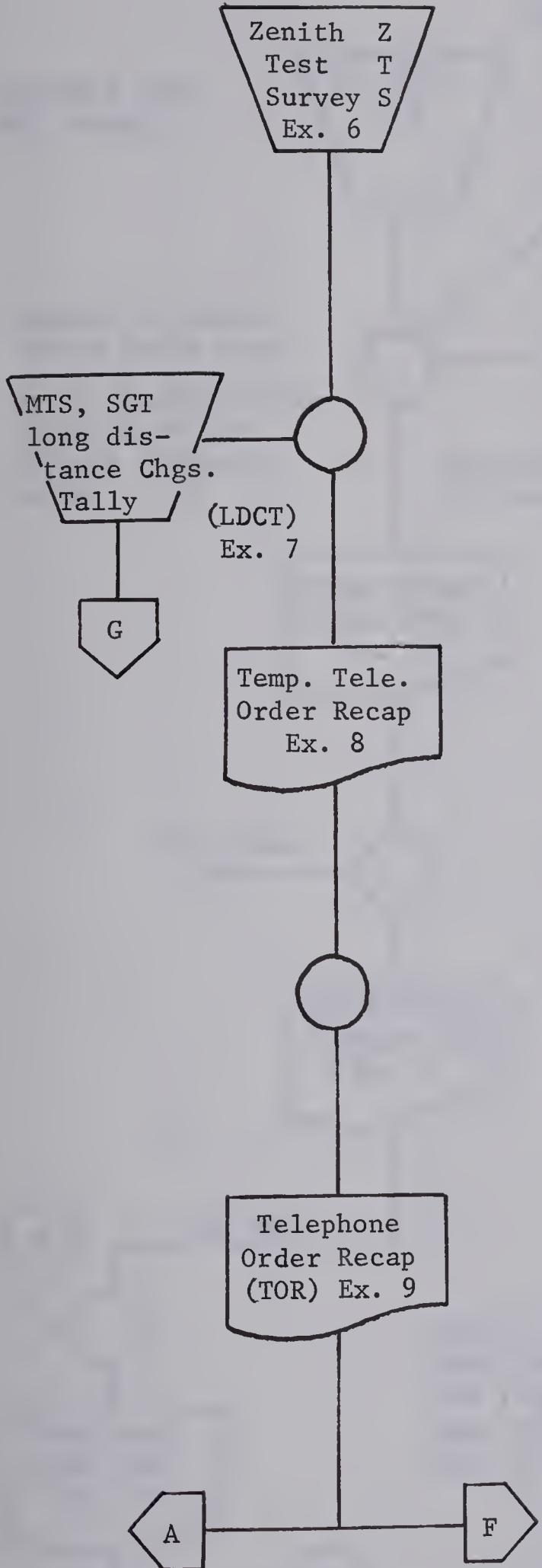
Stern, Hawkins. "The Significance of Impulse Buying Today," Marketing Research, 2nd ed. Cincinnati: South-Western Publishing Company, 1966.

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APPENDIX A
FLOWCHART OF PROCEDURES

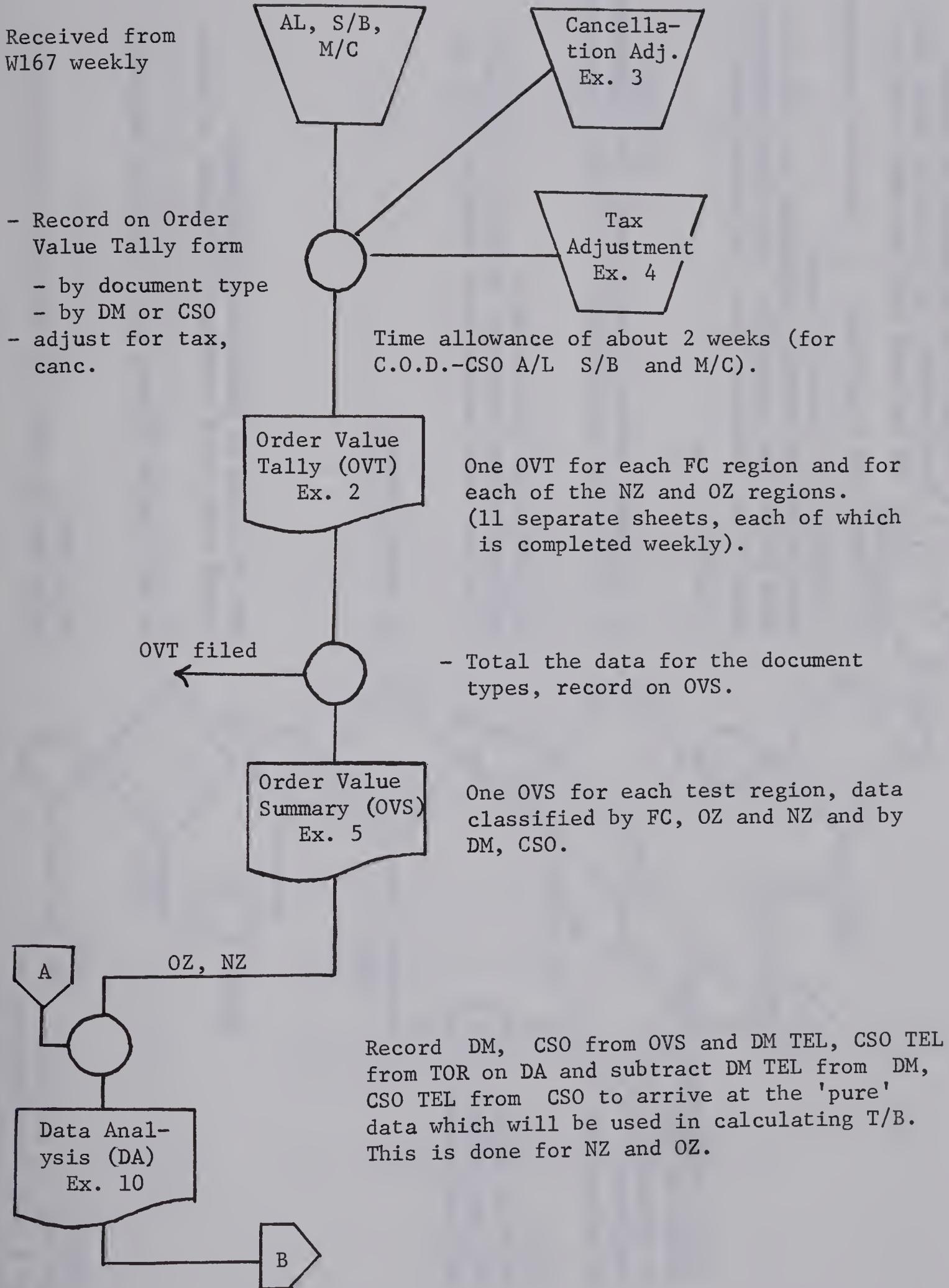


From CSO weekly - one set of forms for each day.

- Record onto Temporary Telephone Order Recap
- Hold for LDCT
- Compare number of calls recorded by telephone companies to those recorded by CSO personnel.
- Calculate adjustment factor
- If above discrepancy is large, communication with District Sales Supervisor, and CSO Supervisor

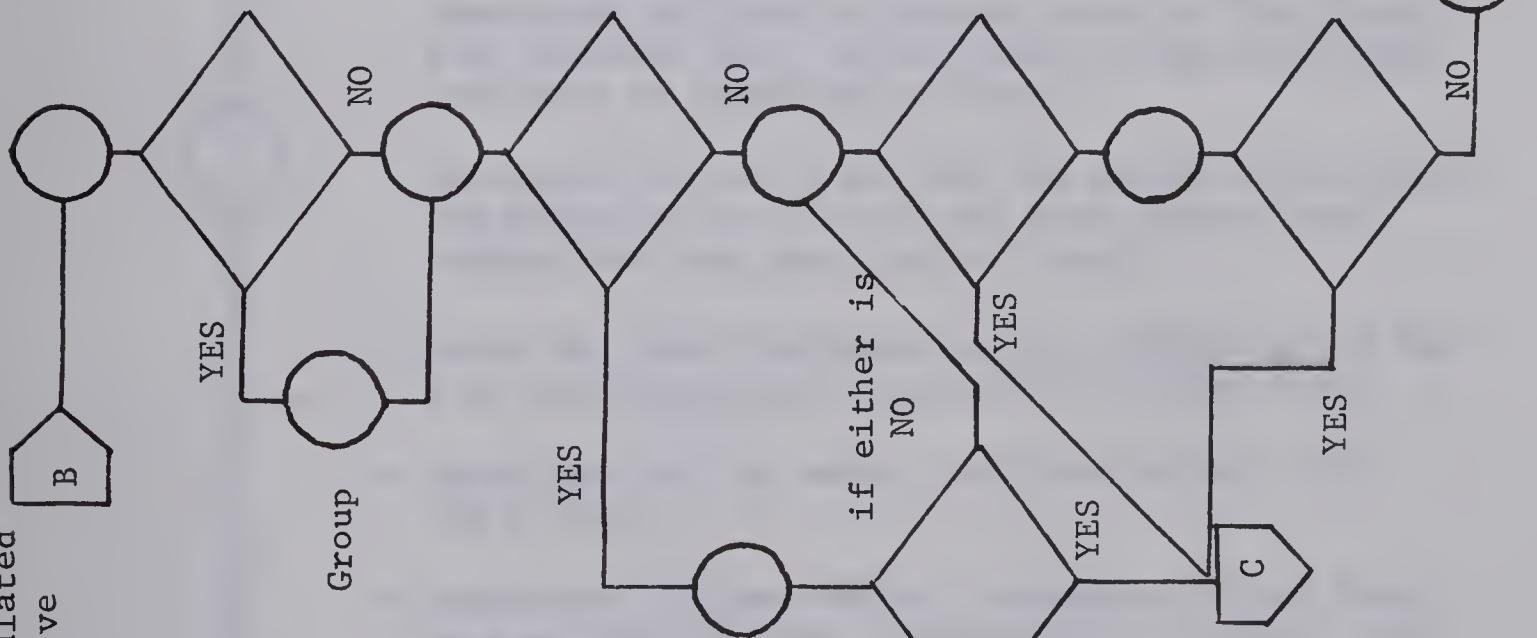
- Adjust data and record onto telephone order recap, and make calculations shown.

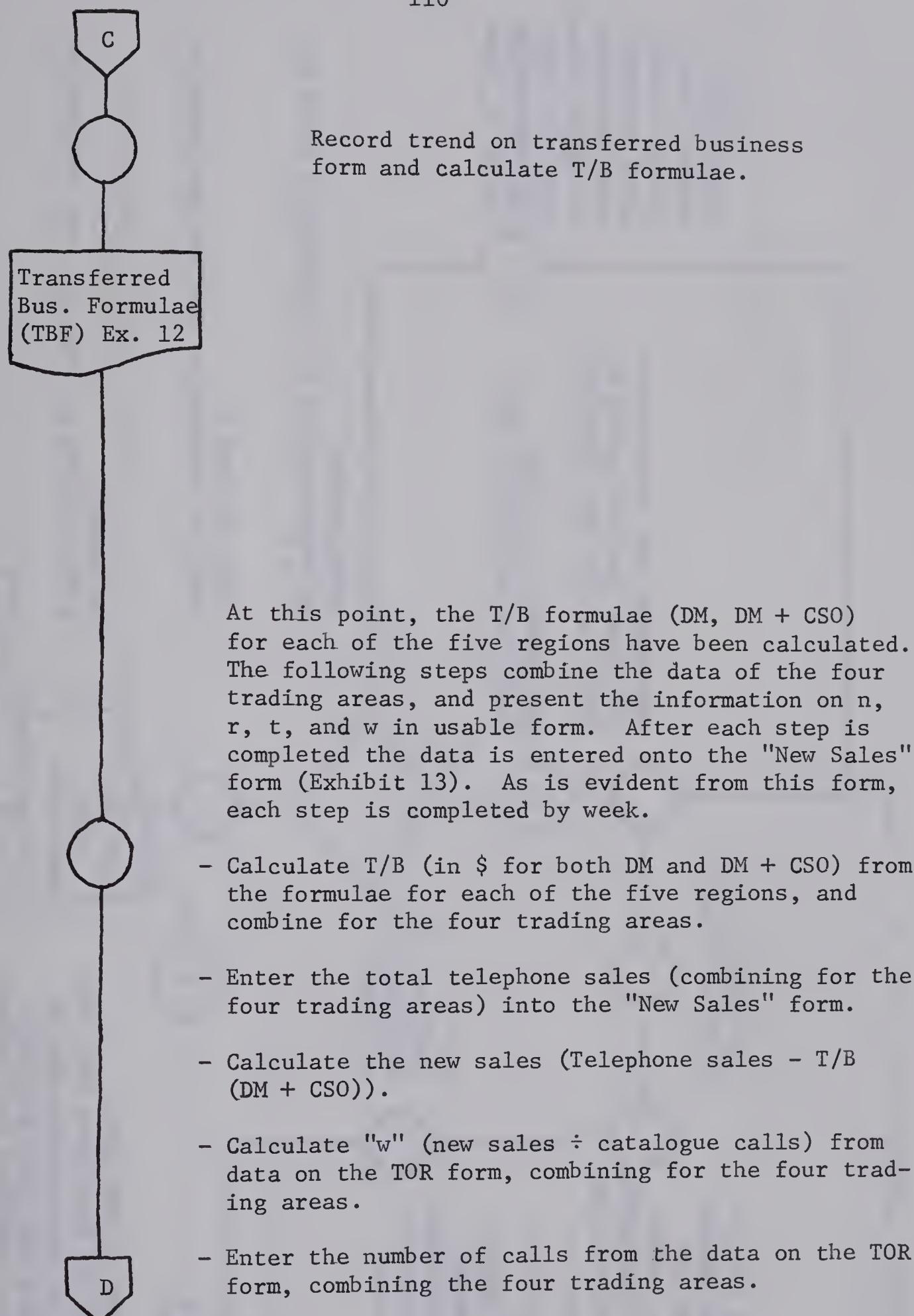
(One TOR for each NZ and OZ region under test 7 forms in total)



The T/B formulae (for DM, DM + CSO) is calculated for each of the five regions.

Graph data by week, and ascertain and separate the trends.





D

TOR (NZ) - combined for trading areas, and TOR (OZ); both adjusted for interference due to entrance and exit from test set. (See pages 53 and 54.)

New Sales
(NS)
Ex. 13

Records on previous Zenith results

F

Data is given by week (or some combination of weeks).

Find the correlation between the number of calls (m) and t .

Is correlation = 0 at acceptable level of significance.

Estimate realistic long run ' r '
 $= R$.
which would affect Zenith service.

YES

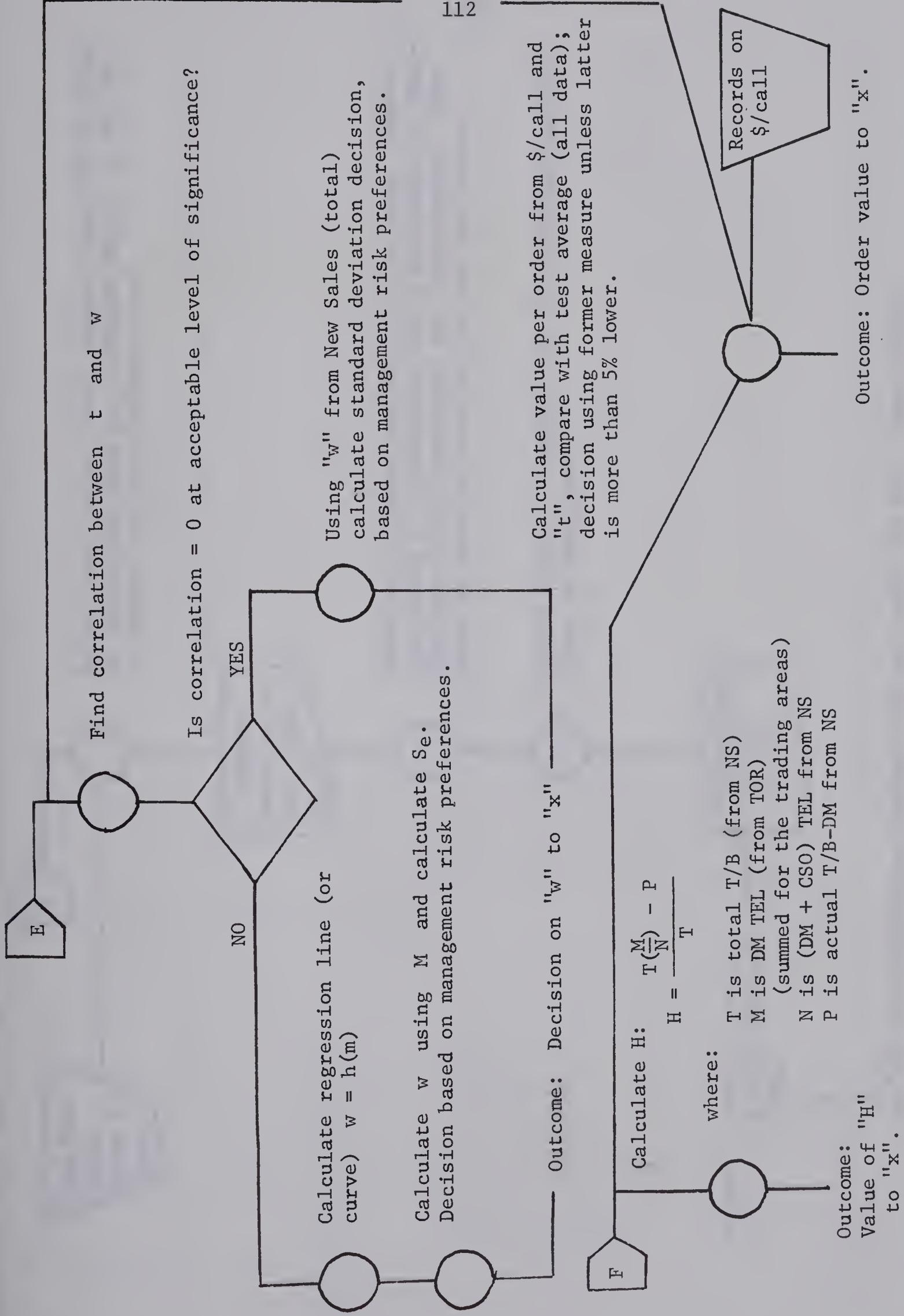
Transform r - response in terms of calls/catalogue - to m - calls per week (or whatever period decided upon).

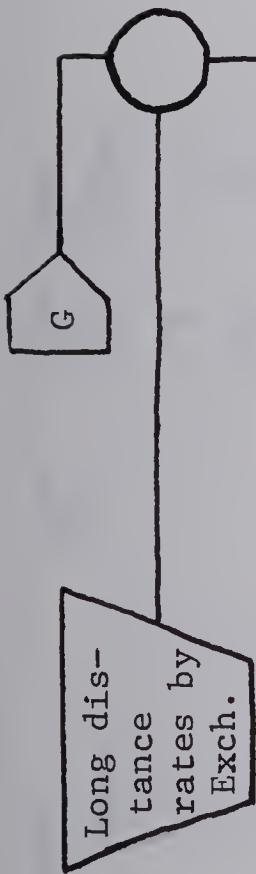
Calculate regression line (or curve) $t = f(m)$

Using "t" from TOR calculated from $\sum CO \div \sum C$ calculate standard deviation. Make decision, based on management risk preferences.

Calculate M where
 $M = g(R)$

E — Outcome: Decision on " t ": to " x "





Record total calls, total charges from LDCT by Exchg.
No distinction made as to whether Exchg. is NZ, OZ,
or NZ-BE. Calculate average time.

Average
length of a
call (ALC)
Ex. 14

Construct a random sample of 100 Exchanges divided (by proportion of catalogues) into Q Exchanges for Manitoba and (100-Q) Exchanges for Saskatchewan. This would be done for both the ETA and NETA areas.

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Record sample on average cost form and make calculations as indicated.

Average Cost
(AC)
Ex. 15

Outcome: Average cost of
a call, ETA and
NETA.

to "x"; to calculations average cost per order (in text, pages 56-61).

Records 'X'

Records		'X'		Flow Chart	
ETA	NETA	C ₁	C ₂	r ₁	r ₂
E ₁	E ₂	t ₁	t ₂		
G	G	w ₁	w ₂		
D ₁	D ₂	H ₁	H ₂	C r t w v G	

These factors previously calculated, methods discussed in body of text.

where:

C - catalogues
E - variable cost per order (% of sales)
G - factor for reducing gross sales to net.
D - difference in delivery costs (DM - CSO)

where:
C - calls/catalogue/year
t - portion of calls resulting in an order
w - proportion of new order calls
H - factor used in calculating additional postal charges.

A - Long distance charges

V - order value

$$\text{Is } \frac{ps_1}{bs_1} \geq 1; \frac{ps_2}{bs_2} \geq 1?$$

Calculate ps₁; ps₂
bs₁; bs₂

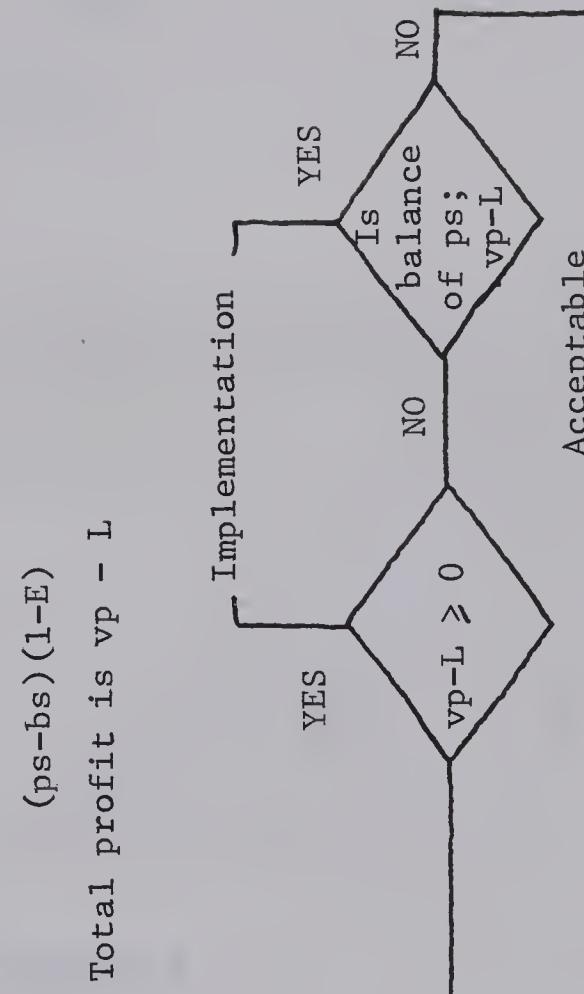


Calculate ps₁; ps₂
bs₁; bs₂



where:
Variable profit (before fixed costs) (vp)

(ps-bs)(1-E)
Total profit is vp - L
Implementation



where:
r - calls/catalogue/year
t - portion of calls resulting in an order
w - proportion of new order calls
H - factor used in calculating additional postal charges.

A - Long distance charges
V - order value

Calculate vp₁; vp₂
and add together.

Acceptable

APPENDIX B

EXHIBITS

EXHIBIT 1 ADDRESS LABEL SAMPLES

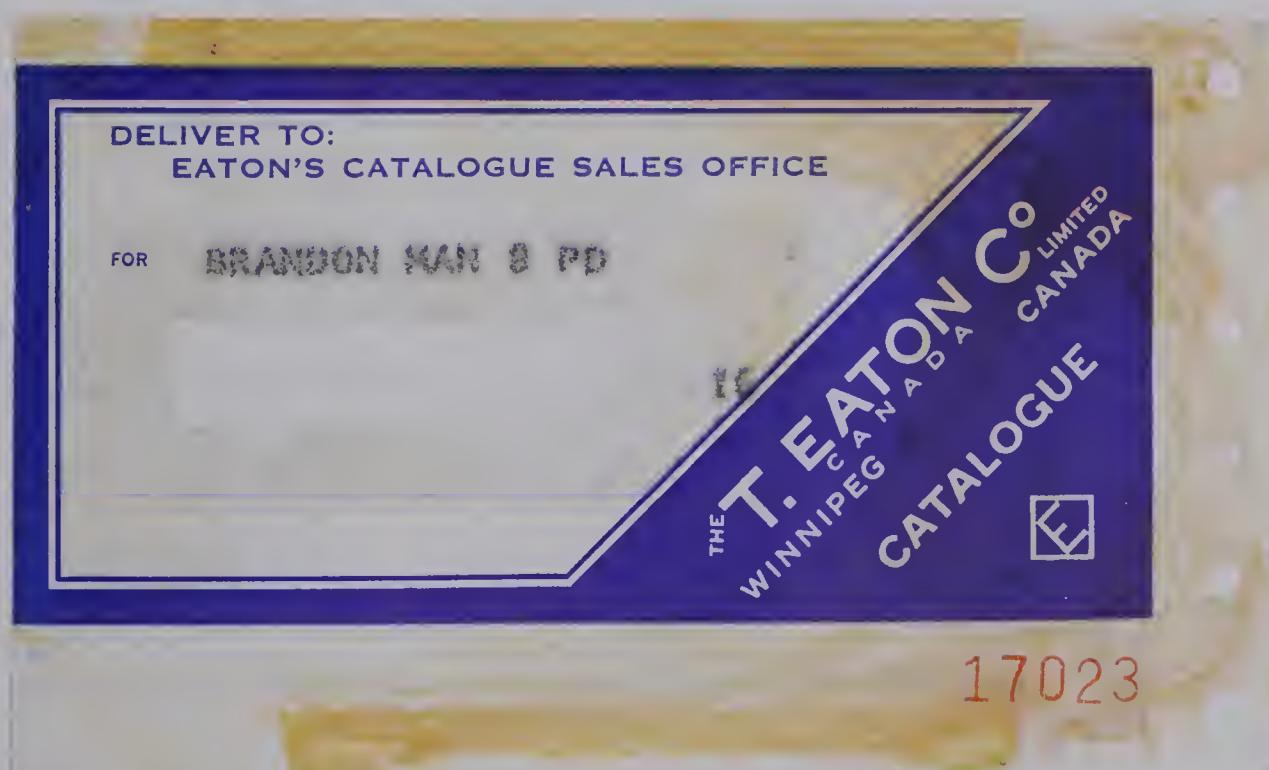
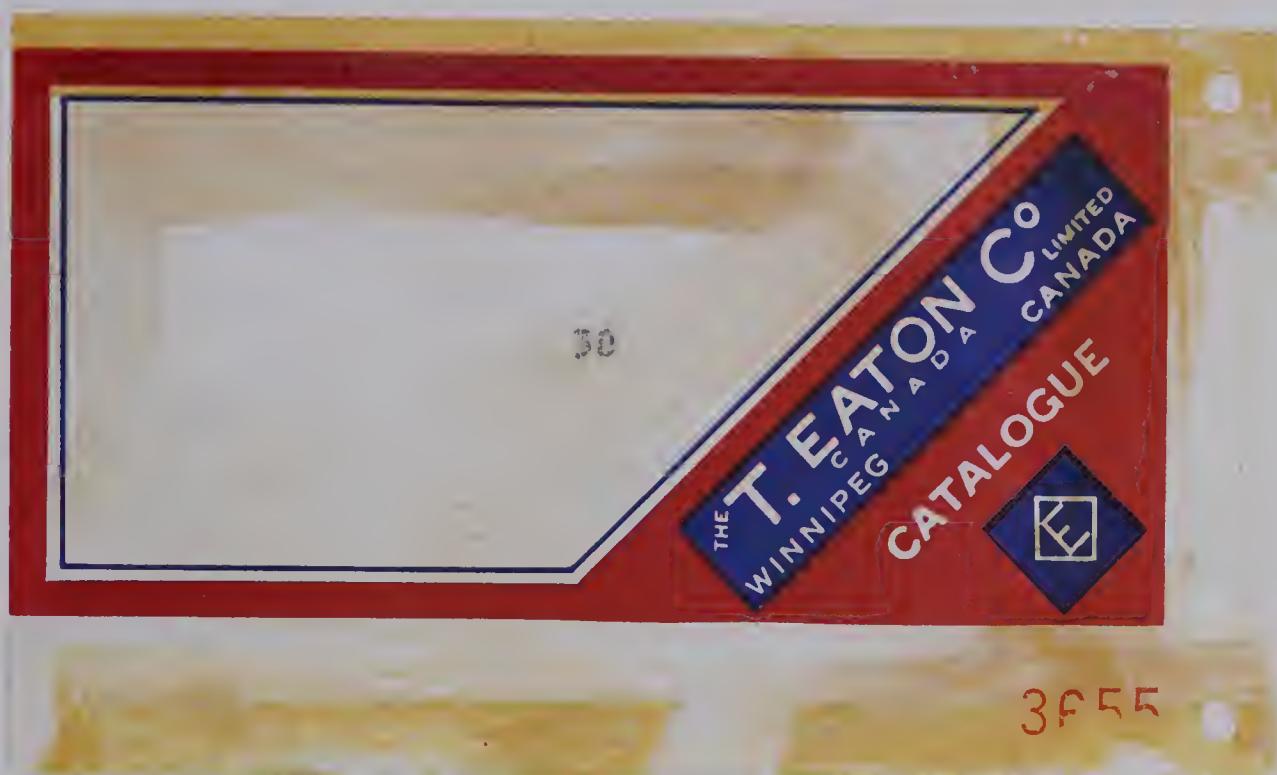


EXHIBIT 2 ORDER VALUE TALLY FORM

General data

1. Nature of region
 - (a) Free call
 - (b) New Zenith
 - (c) New Zenith - Brandon Extension
 - (d) Old Zenith
2. CSO name
3. Week ending

Sales data

1. Vertical axis
 - (a) Name of post office
2. Horizontal axis
 - (a) Order values of direct mail shipments
 - i) Address labels
 - ii) Shipping bills
 - iii) Merchandise control slips
 - (b) Order value of shipments to CSO
 - iv) Address labels - both paid and account
 - v) Address labels - C.O.D.
 - vi) Shipping bills
 - vii) Merchandise control slips

Summations

$$\Sigma \text{ unadjusted direct mail sales} = \Sigma(i) + \Sigma(ii) + \Sigma(iii)$$

$$\Sigma \text{ adjusted direct mail sales} = \Sigma \text{ unadjusted} \div 1 + \text{Tax where tax is a factor from the tax adjustment form (Exhibit 4)}$$

$$\Sigma \text{ adjusted C.O.D.} = \Sigma(v) \times \text{cancellation adjustment (Exhibit 3)}$$

$$\Sigma \text{ unadjusted CSO sales} = \Sigma \text{ adjusted C.O.D.} + \Sigma(iv) + \Sigma(vi) + \Sigma(vii)$$

$$\Sigma \text{ adjusted CSO sales} = \Sigma \text{ unadjusted CSO sales} \div 1 + \text{tax.}$$

EXHIBIT 3 CANCELLATION ADJUSTMENT

Vertical axis

1. Week ending

Horizontal axis

1. Value of filled orders
2. Value of cancelled orders
3. (1) + (2)
4. [(1) + (2)] ÷ (1)

The cancellation factor to be applied each week in Exhibit 2 is given by 4.

The cancellation factor used in the extrapolation formulae is given by the sum of (1) and (2) (above) for the total period of the study.

EXHIBIT 4 TAX ADJUSTMENT

Vertical axis

1. Week ending

Horizontal axis

1. Gross sales (gross demand less cancellations), including tax
2. Total tax
3. (1) - (2)
4. (2) \div [(1) - (2)]

The tax factor to be applied each week in Exhibit 2 is given by
(4).

EXHIBIT 5 ORDER VALUE SUMMARY

General data

1. CSO name

Sales data (from Exhibit 2; order value tally)

Vertical axis

1. Week ending

Horizontal axis

1. Value of orders from the free call area

(a) direct mail

(b) CSO

2. Value of orders from the New Zenith area; with a separate column for the Brandon-extension area

(a) direct mail

(b) CSO

3. Value of orders for the old Zenith area (Brandon and Prince Albert only)

(a) direct mail

(b) CSO

Summation:

1. $\Sigma(1a); \Sigma(1b); \Sigma(2a); \Sigma(2b); \Sigma(3a); \Sigma(3b).$

EXHIBIT 6 ZENITH TEST SURVEY FORM

ZENITH TEST SURVEY

EXHIBIT 7 LONG DISTANCE CHARGES TALLY SHEET

General data

1. CSO name
2. Month ending

Cost data

Vertical axis

1. Name of Exchange

Horizontal axis

1. Cost per 3 minute call
2. Cost for first additional minute
3. Cost for second additional minute
4. Other
5. Total number of calls
6. Total long distance charges
7. Average

Summations:

1. $\Sigma(5)$
2. $\Sigma(6)$
3. $\Sigma(6) \div \Sigma(5)$

EXHIBIT 8 TEMPORARY TELEPHONE ORDER RECAP

General data

1. CSO name
2. There is one form for each of the New Zenith areas; and for each of the Old Zenith areas. The Brandon-Extension data is kept separate from the Brandon-Trading data.

Sales data

Vertical axis

1. Week ending

Horizontal axis

1. Direct mail
 - (a) Catalogue sales
 - i) Number of orders
 - ii) Value of orders
 - (b) Store sales
 - i) Number of orders
 - ii) Value of orders
2. CSO
Same categories as above.
3. Inquiry
 - (a) Catalogue inquiries
 - (b) Repair service
 - (c) Accounts
 - (d) Other
 - (e) Store inquiries
 - (f) (a) + (b) + (c) + (d) + (e)
4. Totals
 - (a) Total calls for catalogue orders plus inquiries pertaining to the catalogue operation.
 - (b) Catalogue orders
 - (c) Analogous to (a), but pertaining to the store
 - (d) Store orders

EXHIBIT 8 (Continued)

Summations (by month)

1. The summation of the number of long distance calls is recorded from the long distance charges tally sheet (Exhibit 7).
2. (a) + (c) (above) Since this data has been entered on a Thursday-Wednesday basis, while data from the telephone company covers a period of one month adjustments using the daily recap forms will be made such that the period being covered will be the same.
3. Multiplication factor is (1) ÷ (2).

EXHIBIT 9 TELEPHONE ORDER RECAP

General data

1. CSO name
2. Nature of region
 - (a) New Zenith
 - (b) New Zenith - Brandon Extension
 - (c) Old Zenith

Sales data

The same format as the temporary telephone order recap form is used, the data in Exhibit 9 being the data in Exhibit 8 x the adjustment factor.

Summation:

1. Σ for each column for the period of the test.
2. The number of weeks between the initiation of the test and the distribution of Winter Sale catalogues.
3. r_A - the number of calls in the period above.
4. The number of weeks between the distribution of Winter Sale catalogues and the end of the test period.
5. r_B - the number of calls in the period above.
6. Σ number of catalogue orders over the test period.
7. Σ catalogue volume over the test period.
8. Σ direct mail sales over the test period.
9. Σ CSO sales over the test period.

EXHIBIT 10 DATA ANALYSIS

General data

1. CSO name
2. Nature of region
 - (a) New Zenith
 - (b) New Zenith - Brandon Extension
 - (c) Old Zenith

Sales data

Vertical axis

1. Week ending

Horizontal axis

1. Total direct mail sales (from order value summary).
2. Direct mail telephone sales (from telephone order recap).
3. (1) - (2).
4. Total CSO sales (from order value summary).
5. CSO telephone sales (from telephone order recap).
6. (4) - (5).
7. (1) + (4).
8. (2) + (5).
9. (7) - (8).

Summations:

1. All columns for the total test period.

EXHIBIT 11 DATA ANALYSIS SUMMARY FORM

General CSO

Vertical axis

1. Week number

Horizontal axis

1. DM + CSO - Free Call
2. DM + CSO - New Zenith
3. DM - Free Call
4. DM - New Zenith

EXHIBIT 12 TRANSFERRED BUSINESS FORMULAE

General data

1. CSO name
2. Nature of region
 - (a) New Zenith
 - (b) New Zenith - Brandon Extension

Sales data

Vertical axis

1. First time period
 - (a) DM + CSO
 - (b) (DM + CSO) FC adjusted for NZ
 - (c) (DM + CSO) transferred
 - (d) DM
 - (e) (DM)FC adjusted for NZ
 - (f) (DM) transferred
2. Second time period

Same steps as for first time period.

Horizontal axis

1. Free call area
 - (a) and (d) only.
2. New Zenith
 - (a) through (f).

The exhibit assumed a two time period division, the same format would hold for n time periods.

EXHIBIT 13 NEW SALES

General data

1. Nature of the area
 - (a) Trading areas
 - (b) Brandon Extension

Sales data

Vertical axis

1. Week ending
2. Week number

Horizontal axis

1. Total catalogue telephone sales, combining all four test trading areas (a separate form is used for the Brandon extension). (Data from telephone order recap.)
2. Transferred business (DM + CSO) (Calculated from T/B formulae).
3. Transferred business (DM) (Calculated from T/B formulae).
4. New sales (1 - 2)
5. "w" (4) ÷ (1)
6. "t" number of catalogue orders ÷ number of calls pertaining to catalogue operations (from telephone order recap).
7. Number of calls pertaining to catalogue operation.

Summation:

1. All columns.

EXHIBIT 14 AVERAGE LENGTH OF A CALL

General data

1. Province
2. Data collected separately for Brandon-Extension

Cost data

Vertical axis

1. Exchange

Horizontal axis

1. Total calls (from long distance charges tally sheet).
2. Total charges.
3. Average cost (2) ÷ (1).
4. Cost per 3 minute call.
5. Cost per each additional minute.
6. Average time (3) + [(3) - (4)] ÷ 5.

Summations:

$$\text{Average time} = \frac{\sum (\text{Total calls})(\text{Average time}) \text{All exchanges}}{\text{Total calls for all exchanges}}$$

EXHIBIT 15 AVERAGE COST

General data

1. Average length of a call.
2. Exchange within trading region.
3. Exchange outside trading region.

Cost data

Vertical axis

1. Exchange

Horizontal axis

1. Number of household telephones.
2. (1) as a % of total of Exchanges under consideration.
3. Charge for a three minute call.
4. Charge per additional minute.

Summations:

$$\text{Average cost} = \sum_{\text{All Exchanges}} [(1)(2) + (1)(\text{Avg.time} - 3)(3)].$$

EXHIBIT 16 ZENITH TEST SURVEY

Telephone Call Sampling ProcedureResponsibilityAction

- Each member of staff answering phones in CSO.
1. Makes sure there is a pad of forms by each phone.
 2. At beginning of each day, fills in name of CSO, and the date.
 3. Takes the call and completes business, as usual.
 4. Makes the entry on the record sheet after each Zenith call. Calls from Zenith territory may be identified from the post office. The attached (sheet) lists the post offices for non Zenith calls.

Records the following for Zenith calls:

- (a) Name of post office (abbreviate where possible) in space denoted "Telephone Exchange No."
- (b) Total order value of catalogue items.
- (c) Total order value of store items.
- (d) Total order value of goods displayed, or otherwise stocked, at the CSO.
- (e) A check () to indicate the method of shipment - CSO for merchandise to be delivered to the CSO, DM for direct mail.
- (f) A check in the proper category for a call which does not result in an order.

"Catalogue" refers to a request for a Catalogue.

"Store Inquiry" refers to any inquiry pertaining to the Store.

Senior Clerk

5. Collects record sheets each day, fastening them together.
6. Sends in sheets covering Monday through Saturday with the Saturday sales orders. The envelope containing the record sheets to be addressed: Zenith Test Survey, Industrial Engineering Department, Winnipeg.

EXHIBIT 17 POST OFFICES FOR NON ZENITH CALLS - PRINCE ALBERT

Alingly

Claytonville

Clouston

Crutwell

Davis

Fenton

Henribourg

Kalyna

MacDowall

Red Deer Hill

Spruce Home

All other calls can be designated as Zenith Calls. Record all such calls. Do not ask customer if she is calling using our Zenith number.

NOW!

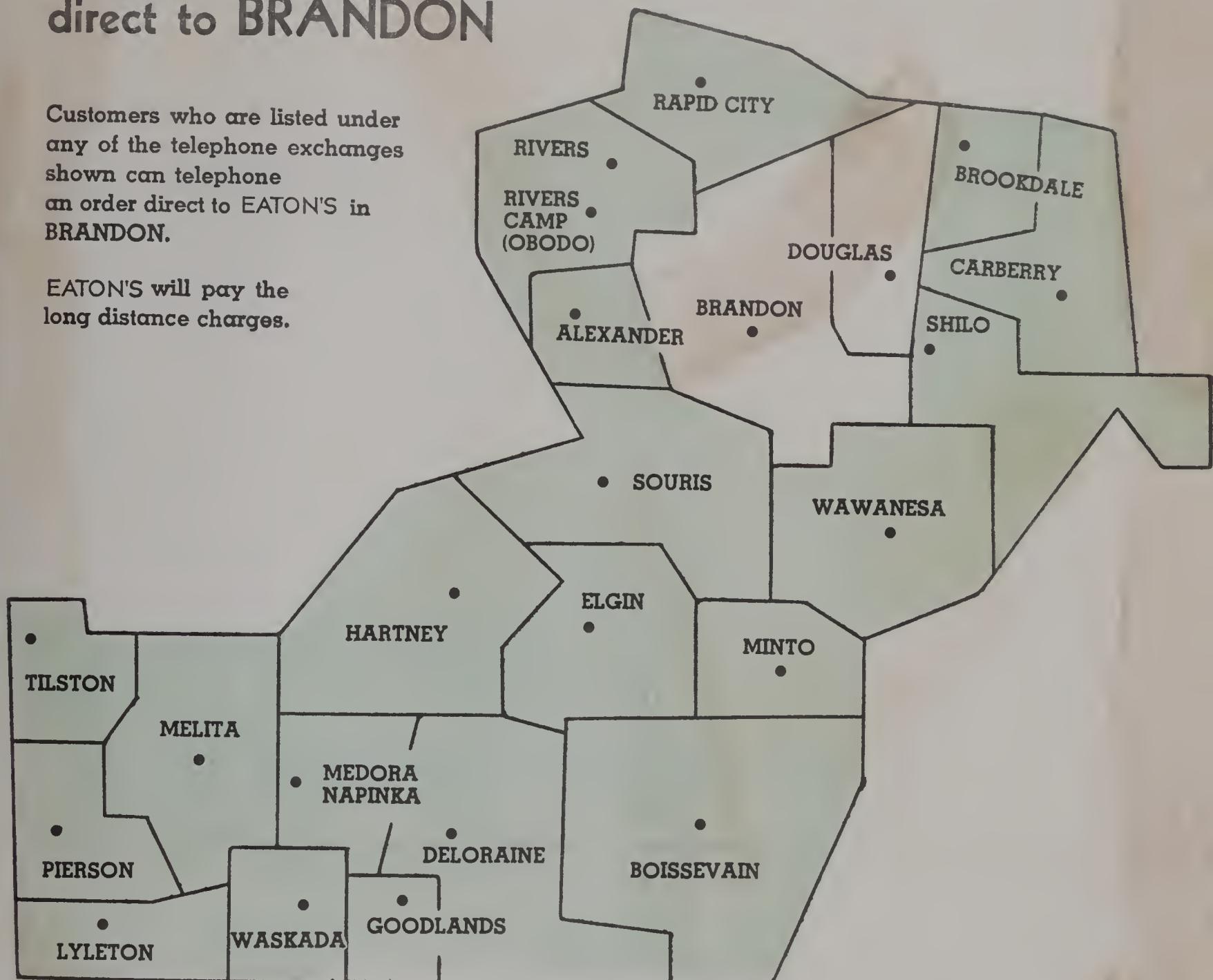
**EATON'S offers you
faster, easier shopping with
FREE Telephone Ordering Service
direct to BRANDON**

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Exhibit 18. Sample of Advertising

Customers who are listed under any of the telephone exchanges shown can telephone an order direct to EATON'S in BRANDON.

EATON'S will pay the long distance charges.



JUST PHONE — No orders to make out and mail !

Customers living in the BRANDON or DOUGLAS telephone exchange areas call 727-1411

Customers living in any of the other telephone exchange areas shown call operator and ask for ZENITH 15000

TELEPHONE SHOPPING HOURS:
Mon., Tues., Thurs., Sat.
9.00 a.m. to 6.00 p.m.
Wed. — Closed all day
Fri. — 9.00 a.m. to 9.00 p.m.

**THE PERFECT REMINDER OF EATON'S NUMBER . . .
KEEP THIS NOTICE IN YOUR LATEST EATON CATALOGUE.**

EXHIBIT 19 SAMPLE OF ENVELOPE USED IN MAILING ADVERTISING

EATON'S

*Bringing You....
A New Phone Order Service.*

B29974